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THE COUNTRY OF THE SHANS.*

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I am not going to-night to tell you tales of stirring adventure, or of lengthy travels pursued under trying conditions, of hardships so cheerfully borne and privations so gallantly endured that we feel proud, not only of our countrymen, but also of our country-women. Such tales you have lately listened to; and the adventures of Mrs. J. G. Scott, who has accompanied her husband in all his travels, would make a thrilling narrative. I cannot tell you of visits to hitherto quite unknown peoples; nor, except in trifling matters of detail, has our recent work on the Mekong (Mekawng is the correct spelling) added to our geographical knowledge. The country I propose to describe to-night has been traversed by others, and descriptions of the tribes inhabiting it are to be found in the writings of many previous travellers. Francis Garnier, whose adventurous career is full of fascination; M. Pavie, the distinguished explorer to whom the French colonial party owes so much, and whose acquaintance I had the pleasure of making on the Mekong last year, with M. Lefevre Pontalis, his able lieutenant; Prince Henri D'Orleans, whose late wonderful journey must excite our warmest admiration (though, as a patriotic explorer, I may perhaps be permitted a passing regret that success did not crown my repeated endeavours to have some of the problems on our own frontier, which the Prince claims to have solved, solved by British explorers instead); my brave friend, Lieut. Otto Ehlers, whose untimely death, it is feared from starvation, geographical societies, as well as his friends, deeply deplore; Mr. J. G. Scott, well known in the literary as in the political world;

* Paper read at the Royal Geographical Society, March 9, 1896. Map, p. 688.

Lord Lamington; Captain G. J. Younghusband, whose adventurous journey to Keng Tung at the critical period when we first occupied Mandalay, showed him to be a true chip of the old block;—all these have written eloquently about the Shans and the hill tribes of Indo-China. All I can do is to open for you the gate into this fertile field, and to endeavour to attract your attention to this most interesting corner in the Far East.

The Shan States under British protection form the easternmost portion of our Burmese possessions, and may be said to lie approximately between the 19th and 24th parallels of latitude, and the 96th and 102nd of longitude. They do not, however, by any means cover the whole of the area included between these parallels, but, presenting a broad base towards the Irawadi, narrow down considerably towards the east, forming a rough triangle. To the west lie the great plains of Burma proper, traversed by the Irawadi. To the north and east we have the province of Yunan, with the Chinese Shan districts of Mung Lem and Keng Hung immediately on our borders. To the south are the Karen hills and Siam.

These states present a remarkable variety of natural features. The country to the west of the Salwin is a series of elevated plateaux—great rolling grassy downs separated by deep valleys and intersected by lofty parallel ranges, the general direction of which is north and south. These ranges, in contrast to the yellow downs, are beautifully wooded, and attain to great heights, some of the peaks rising to nearly 9000 feet above sea-level, the general elevation of the plateaux being from 3000 to 5000 feet. Along the valleys flow swift rivers, now through dark and narrow gorges, pent between mighty cliffs, now through alluvial hollows with terraced rice-fields, among which they wind with many a curve. To the east of the Salwin the country is much broken up; no clearly defined range of mountains presents itself, but the eye wanders over a confused sea of forest-clad hills and narrow valleys, relieved here and there only by small oases till Keng Tung plain is reached, beyond which the mountains rise again range upon range in tangled masses to the Mekong. Across the Mekong we have similar features, flat fertile valleys, or terraced uplands lying amid intricate mazes of hills, the drainage system of which is the despair of the reconnoitrer who, limited as to time, and hampered by the exigencies of a boundary commission, endeavours to solve the puzzle from two or three coigns of vantage. In this, however, he is much assisted by the mist which lies in all the valleys in the early morning, clearly marking the courses of the rivers and larger streams, which are difficult to distinguish when garish day destroys all atmospheric perspective.

The Shan States are watered by many considerable streams, but there are only two drainage basins—those (1) of the Salwin or Nam Kong* and (2) of the Mekong, or river of Cambodia. The Menam, the

* Nam Kong is the Shan name; *nam* = a "river."

river of Siam, of which we have heard somewhat lately, lies between these two, and rises just south of the Shan States.

In the northern Shan States, the streams flowing into the Salwin are few and insignificant, the main drainage being into the Irawadi; but in the southern Shan States we find the reverse is the case, and the drainage into the Irawadi is inconsiderable, while several fair-sized streams, flowing south and following more or less parallel courses, empty themselves into the Salwin. These are the Balu Chaung* or Nam Lak, the Nam Pawn, Nam Teng, and the Ben Chaung or Nam Pang. The first is the river of Fort Stedman. It rises to the north of this

THE MEKONG ABOVE TANG AW.

place, and, flowing at first through forest, loses itself in a huge swamp merging into the Inle lake, a vast expanse of water 13 miles long and about 4 miles wide at its upper end, but narrowing towards the south. It is nowhere very deep, and the bottom is overgrown with long and tangled weeds, which rise nearly to the surface. The lake dwellings of the Inthas, an amphibious tribe said to have been originally brought as slaves from the province of Tavoy, rise on piles out of the water in groups near the edge, and floating gardens, on which are grown tomatoes, water-melons, gourds, and the pan-leaf vine, dot the surface of the lake around them. Many large villages are seen on either shore; monasteries and clusters of white pagodas, built on the extremities of the spurs running into the lake, are reflected in its placid depths; and on the eastern shore, lying back from the water on some rising ground, are the houses and barracks of Fort Stedman.

* The Burmese name; *chaung* = "stream."

The Inle lake is well worth a visit, and the method of rowing adopted by the Inthas is peculiar. Men and women are equally expert. They stand one at the bow and the other at the stern of the boat. The rower holds the paddle lightly in one hand to guide it, and, balancing himself on one leg, he works the paddle with the other by hooking the foot round the upper portion of the blade. They complicate matters further by frequently carrying a spear in the hand not occupied with the paddle, with which they transfix any passing fish. Their dexterity both with spear and paddle is wonderful, and they supply all the bazaars in the neighbourhood with fish.

At Fort Stedman travellers are warmly welcomed by the regiment stationed there, and in the winter most excellent wildfowl-shooting is to be had. Above Fort Stedman, 18 miles away and 2000 feet higher, is Taunggyi, the civil station, which has an elevation of 4800 feet above sea-level.

Here Mr. Hildebrand, superintendent of the southern Shan States, hospitably entertains visitors in a very nice house recently built for him by the government. Comfortable and well furnished, with a pretty and extensive outlook, it gives one the feeling of being in a pleasant little country house in England; and this feeling will be strengthened when Mr. Hildebrand has perfected his plans for garden and orchard, already fairly stocked and yielding a good supply of English flowers, fruit, and vegetables.

Fort Stedman is to be abandoned, and our garrisons advanced further east.

The affluents of the Salwin are not navigable throughout their length; waterfalls or rapids occur frequently. The largest and most beautiful stream is the Ben Chaung, or Nam Pang, which joins the Salwin 10 miles below Kenghkam. At Kenghkam it is a quarter of a mile broad, with lofty wooded hills on either bank, wooded islands breaking up its channel. Curious parallel ridges of rock rise to within a few feet of the surface in the cold weather, but the water is very still here, though just above it descends over a series of cascades among trees and shrubs which grow in lines and clumps right across the river. Again, at many points in its course falls of 30 to 40 feet occur, and as it approaches the Salwin, where the lofty green hills close in on it, it rushes down a steep descent in one long roaring rapid, for several hundred yards, a mass of foaming, white, tumbling waters.

At Kenghkam the river is crossed by boats, one of the regular ferries being here. It is on the main road to Keng Tung. The village is very pretty, and with its fringe of coconut trees suggests Ceylon. The height above sea is 1200 feet. There is a very curious feature a few miles above Kenghkam: a limestone ridge runs across the river, forming an island with a central spine of jagged peaks. I approached it from the south-east; here, at the ferry between two villages, the river

flows calmly by, disappearing into the deep shade of wooded gorges. Arrived on the island, a path leads one across some terraced fields to the foot of the peaks above mentioned; it climbs painfully up the rough limestone for nearly 200 feet, and the traveller thinks with anything but pleasure of the descent awaiting him round the corner. Imagine, then, his astonishment and delight when he turns the corner and finds that he is on the level of the upper branch of the river, a thunderous noise to the left, down among some dark trees, denoting its efforts to rejoin the lower half. Climbing a height of 30 feet alongside a beautiful waterfall fringed with tall feathery grasses, and turning another shoulder of the ridge, the traveller emerges on a lovely expanse of

WAN THAM.

meadow-land, through which the placid river gently flows, with as little care for the turmoil and strife awaiting it as any happy youth setting forth on life's rough way.

A curious disappearance of streams is a common feature in this country. Take, for instance, Sa On, a pretty spot among the hills. Above the village some rice-fields are shut in by a limestone ridge; through these fields runs a little stream, which makes straight for this barrier; it flows under and round some fallen boulders, and then disappears in a little chasm behind. Some 200 feet below, and a quarter of a mile away, it emerges from a lofty cave, and flows calmly onwards, through the terraced rice-fields and gently sloping valley. I have said this is a common feature in this country, and Lord Lamington describes

a similar disappearance on a very large scale at Mong Hang. I had too much work to do while I was there to find time to visit this spot, but Lord Lamington's account is as follows: "The cave where the river enters on its subterranean course is in a sheer face of rock some 200 feet high. The height of the cave is about 140 feet, its width at the entrance 300 feet, broadening in the interior to nearly 500 feet; the depth is about 300 feet. At the right-hand bottom corner, a tunnel, at an angle of 45° with the cave, provides a passage for the river. I followed this for some distance, but with no other result than that of getting wet. It is said of this cave that a cut teak log floated down never reappears, whereas an entire tree, with its root and branches, makes the journey successfully."

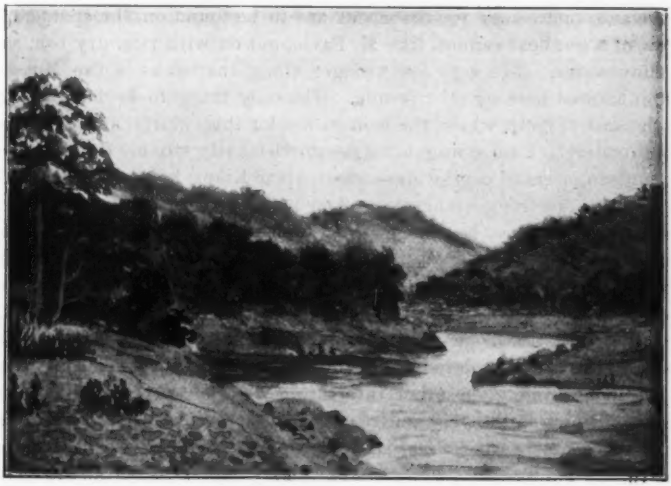
Mong Hang is just within our border on the road to Chieng Mai (Zimme), and Mr. E. B. Gould,* who visited the place in 1886, says, "It occurred to me that formerly this tunnel did not exist. This valley would then have been one deep mountain lake, having its outlet by the Me Sum into the Me Nam, the watershed being low here. This may then have been the lakes of Chieng Mai, the mention of which by old writers, and the non-existence of which at the present day, are difficult to reconcile." This is a very plausible theory, which would be still more so if this feature of the disappearance of a river into a hillside were less common; but perhaps lakes have formerly existed in each case.

The Salwin, in its course through the Shan States, is a deep river with strong currents and many rapids; steep wooded hills, rocky and precipitous, shut it in, with here and there a sandbank; paths follow the banks for short distances only. Ferries, many of them unimportant, are frequent, but the river is only navigable for short distances. The average width between the banks is 400 yards, and the width of water in the winter from 150 to 200 yards, though in places the rocks close in, and the width is only 70 yards. In the rains the river rises about 50 feet. Major (now Lieut.-Colonel) Barrow, who accompanied Mr. Ney Elias's mission in 1889–90, considered that a powerful light-draft steamer could ply on the Salwin between Ta Hué Pon and Kaukhnyat, a distance of 150 miles. Country boats can and do ply between these places. Below Kaukhnyat the river becomes unnavigable. Sixty miles below this place is Kyo Dan, the great timber depôt for the teak floated down from the Karenni country. A cable stretched across the river catches the logs, which are then made up into rafts and floated down the river to Kado, near Moulmein, where the revenue is collected.

On the east of the Salwin, its only important tributary is the Namkha, flowing through Nung Lem and part of the northern Shan States.

* Vice-consul at Chieng Mai.

We now come to the Mekong, which somewhat resembles the Salwin on a slightly larger scale. Lofty, or low, wooded banks dropping steeply to the water, huge masses of rock cropping up here and there, penning the whole river in dangerous seething narrows; strong currents, raging rapids, and huge sandbanks always changing their form and place;—these are the main features of the Mekong wherever we saw it. The ferries in this portion of the river are at Ban Lik, Ban Law, Pakha, Hsup Lwi, Keng Lap (on the road from Keng Tung to Mongsin), Tang Aw, Keng Hsen, and Keng Kong. At most of these ferries the current is somewhat strong, and there is risk of loss in swimming pack-animals across. The river is navigable between Tang Aw and Luang Prabang.



FERRY AT BAN LAW.

M. Pavie's party performed the journey in country boats, and Lieut. Simon takes great credit to himself, with justice, for having reached Tang Aw, or Tang-ho, as he calls it, in a gunboat. He wrote from that place on October 26 last—

"It is not without a certain satisfaction that I am able to date this letter from Tang-ho, a place which is the extreme limit of all possible navigation on the Mekong. I have succeeded in reaching this point, which is 2500 kilomètres from the sea, at an altitude of 475 mètres, in a gunboat, which has overcome all the obstacles of the Mekong without a scratch or the slightest accident. Men and vessel have come forth intact from these thousand dangers, and our flag can float proudly at the stern of the first steam-vessel which has accomplished this extraordinary feat with a success exceeding the most sanguine anticipations.

"At Tang-ho the Mekong is no longer a river. The stream, which is very much narrowed above Luang Prabang, is here a torrent falling in cascades over a distance of from 8 to 10 kilomètres, and forming for navigation a *cul-de-sac* where it is absolutely necessary to stop. To ascend further is out of the question even for canoes. The people along the banks have not even taken the trouble to build canoes, and you look in vain for an individual capable of using an oar, a punt-pole, or a paddle.* I know not how my successors may overcome the difficulty, but I feel certain that without more appliances than I could command, they will not get beyond Tang-ho. The country itself is scarcely inhabited up to Mongsin.

"The question of food keeps me busy. We have now only a little wine and such other provisions as are to be found on the spot. The crew of a gunboat cannot, like M. Pavie, get on with rice, dry fish, and muddy water. The very few villages along the banks of the Mekong are inhabited here by poor people. The only thing to be bought here is the sort of cloth which the women use for their skirts, and this is of poor quality. I am going to settle provisionally till my departure at Kiang-sen, a small capital dependent upon Kiang-hai, and peopled by a Laos colony from Kiang-mai. The people are not very interesting, and the authorities, bent under the Siamese yoke, look askance at the French as they do at Kiang-kong. But at present, thanks to our gunboat *La Grandière*, we are in a position to inspire terror, and, if need be, to make ourselves respected."

Another letter from a correspondent of the Society of Commercial Geography, Paris, is dated October 16 of last year. It is sent from Kiang-kong, and gives other interesting details. At Kiang-kong, it appears, which is the very centre of the territory formerly so much discussed as a prospective buffer state, the population consists of a strange mixture of border races, who were extremely impressed by the arrival of a French armed vessel. It appears also from this letter that, if the boat could go up to Tang-ho, it cannot so easily come down. It will have to be kept in the reach of Kiang-kong, but this fact was not looked upon as a disadvantage considering the presence of the English, who were then at Mongsin. The English had there at the date of this letter three thousand men, one thousand of whom were Europeans, and had built a bridge over the Mekong at Kiung-lap, so as to make a continuous route passing from Burma by way of Kiang-tong to Mongsin.

"They have declared," says the writer of this letter, "that the Mekong and both its banks between Kiang-sen and the place where the *Grandière* was lying belong to them, and, by way of asserting their claim actively, they have brought boats over from Burma to be set up

* M. Simon was ignorant of the existence of ferries above Tang-ho, apparently; nor could he have seen the rafts I have mentioned further on.

and put on the river here. This time we shall have got ahead of them." Another gunboat, the *Massie*, has now reached Keng Kong.

There was at this time a French agent at Kiang-sen, but Kiang-kong is described as an ugly and unhealthy place. There are magnificent teak forests in the neighbourhood (the *Times*, January 30, 1896).

At Ban Law ferry the Mekong has a width between the banks of 400 yards, and the stream in the dry weather is 160 yards broad. At Keng Kong the width between the banks is from 600 to 700 yards, and in March the breadth of the stream was 400 yards. A rise of some 40 or 50 feet takes place in the rains. Dr. Le Févre, the French physician with M. Pavie, explored the Mekong on a raft between Ban Lik and Keng Lap. It was rather a risky business, but he accomplished it in

INLE LAKE.

safety. At the worst rapid his boatmen insisted on his hiding out of sight the tricolour, which was proudly floating over his head. They explained that the spirit ("Nat") of this particular rapid never allowed safe passage to a raft that showed any red. Rafts frequently make the journey from Keng Hung to Keng Lap. They bring down salt, which is disposed of to the villages along the banks; and, arrived at Keng Lap, the owners abandon their rafts, and, picking up such goods as they require at Keng Lap, return to Keng Hung overland. These rafts are from 20 to 30 feet long, and from 12 to 20 broad. In the middle is a small bamboo thatched house, in which the crew sleep. They are neatly made, and at the door of the hut is frequently to be seen a pretty young woman, sitting among some flowers or small shrubs in pots arranged on either side, while a bright cloth hangs above her. I was detained at Ban Law for two or three days, waiting for the rest of the mission, and I frequently watched these rafts passing down a bad rapid with a huge rock in the middle, round which the waters raged with great fury. The raft would come gently down the calm reach above, and as it neared the rapid three long bamboo sweeps

were manned fore and aft by the six men of the crew, and, working with all their might, pulling and yelling like lost souls, they were borne irresistibly by, the woman sitting through it all as calm and unmoved as an image of the Lord Buddha. The principal affluents of the Mekong in the Shan States are, in the north, the Nam Lwi and Nam Lam, which join their waters in Keng Cheng territory, and thence flow together to the Mekong. The Nam Lam, for some portion of its course, forms the boundary between Keng Hung and Keng Tung. Below we come to the Mehuok, which now, for the last 20 miles of its course, forms the boundary between Keng Tung and Siam, and the Mekok, which was the old boundary before the encroachments of the Siamese twelve years ago. These encroachments do not seem to have annoyed the Shans much, and Shans and Laos lived side by side in the most friendly manner. Gould tells a curious tale of the friendly relations which existed between these peoples. When Burma and Siam were at war, Keng Tung and Chieng Mai were supposed to be respectively warmly maintaining the quarrels of their suzerains; but this was not really the case. There was an understanding between the chiefs that, while keeping up appearances, they should not really damage each other much. An arrangement was come to that there should be no bullets used except when Siamese soldiers were actually in the field. "It is a fact," says Mr. Gould, "that on one occasion the Chieng Mai forces, driven by the Siamese, arrived before Keng Tung, and a Chieng Mai prince obtained much *kudos* with the Siamese by forcing his elephant alone up to the very gate of the city, in spite of the fire from the garrison, from which he and his beast miraculously escaped unhurt. This feat is intelligible supposing the above understanding existed."

A small stream running into the Mekong at Keng Kong, called the Me Ing, is of importance, as its basin is reserved to Siam by the treaty recently concluded with France.

All along the banks of the Mekong, as indeed in many places on the Salwin, we came across innumerable tracks of wild animals and the pugs of enormous tigers; the latter, indeed, at Keng Kong, and elsewhere, caused us the occasional loss of a pack-animal which had strayed from the camp. In places on the banks I saw large holes dug in the sand and roofed over with bamboo and sand, small embrasures being left commanding the drinking-place of these wild beasts, for which shikaries with untrustworthy weapons lie in wait. I should be sorry to be in one of these holes with a wounded tiger outside thirsting for my blood. Much sport could be had in these hills by any one who could lay himself out for it; but it is impossible to combine sport with survey work—the conditions are incompatible. From Keng Sen to Hong Luk stretches a magnificent plain, and Gould, writing in 1886, says, "Already the big game, which ten years ago was found in abundance on this plain, has retired before the sounds of human labour. Rhinoceroses and wild cattle, which formerly

could be found close up to the walls of Keng Sen, have now disappeared. Herds of deer, however, may still be seen as the traveller crosses the sea of long grass, sparsely dotted with trees, which covers the plain." I have crossed it twice, but was not so fortunate as to see any herds of deer. The last time, though, I saw and shot a brow-antlered deer, with small but very symmetrical horns.

The climate of the Shan States is generally good in the cold weather. The nights are cold till April, and the heat, though great in the valleys, is seldom so oppressive as at Mandalay or Rangoon. Frost is experienced in some parts, but snow, of course, never. The rains begin in the end of April or beginning of May, but there is frequently a break of a week or a fortnight at the end of May. Good hill stations for troops could easily be found; and the sickness we hear of at Keng Tung and Mong Hsing is probably due to imperfect housing and the selection of indifferent sites, necessitated by want of time. The following record of temperature may be of interest. I find that my observations for the Salwin and Mekong give the same average results, *i.e.*—

			Dec.	Feb.	March.	April.
Average height 1200 feet.	Mekong Salwin	Min.	53°	58°	65°	66°
		Max.	80°	83°	88°	90°
			Jan.	March.	April.	
Average height 2800 feet.	At Keng Tung	Min.	40°	53°	66°	
		Max.	85°	85°	90°	

Keng Tung, it will be seen, is always warm during the day, the maximum temperature for the different months varying less than the minimum.

The average minimum temperature of the plateaux rises from 45° in December to 60° in April; and the maximum from 70° to 90°, falling to 80° during the rains.

I have alluded to the mists which lie in the valleys every morning during the cold weather. They occur all over the countries on our north-east frontier, from the Brahmaputra to the Mekong. These mists fill all the valleys and cover all the lowlands till a late hour every morning. In Mong Hsing they seldom rise before noon; and through the damp forest or long wet grass eager to deposit its dew on the traveller's clothes, wetting him through and through at once, the early march is made in a horrible twilight, not born of the dawn, but of dull grey mists, in which the sad trees look dim and unreal; and the sadness of the scene is rendered more melancholy by the plaintive cries of the monkeys protesting against the misery of life. But suddenly the fog lifts and disappears, and with the lifting of the veil the traveller finds himself in the midst of glorious summer sunshine; a gorgeous transformation, and it is difficult to believe that this brilliant sun, these glowing hills, and fertile plains, have been there all the time, hidden by that grey drop-curtain. I found on the Mekong, going down from sunlight into the dark valley, that the thickness of the mist stratum is

from 800 to 1000 feet, and that it does not descend quite to the valley, but hangs at a height of 200 feet above it. Out in the open lowlands it lies quite low.

Many hot springs are met with in the Shan States, and at some places split bamboos are placed over the streams, which deposit sulphur in the form of flowers on the under surface; this is collected and compressed into cakes for sale.

Communications in these states are confined to a few well-defined tracks, and these are not very good, even for pack-animals. The path from Taunggyi to Keng Tung was last summer widened and improved, and made into an excellent mule-track, where two laden animals can pass each other without one of them going over the side. This work reflects great credit on Mr. Litster, executive engineer at Fort Stedman, and his assistants, who carried it out at a very unfavourable season, and in the face of great difficulties.

I do not think that sufficient expert exploration has as yet been done with a view to improving the communication and developing the resources of the country. The navigation of the Salwin might possibly be rendered easier, and the teak trade would be largely benefited by increased facilities for exporting it. Work has been begun on the line of railway from Mandalay to the Kun Lon ferry on the Salwin. It is hoped that it will tap the trade of Western Yunan. I should have been glad to see a line run up into the Southern Shan plateau, at least, if not to the Salwin itself. The construction of the cart-road to Taunggyi has had most excellent results; but a line of rail would, in the opinion of many qualified to judge, greatly advance the agricultural wealth of the country. Potatoes have already been very successful, the cultivation of wheat should be very remunerative, and a brisk trade in vegetables and fruit might be established, while, as Mr. Hildebrand says, there is a pasturage for sheep equal to that of the Wiltshire downs. This line, I venture to think, would be most useful both strategically and commercially.

The Shan States include those of Keng Hung and Keng Cheng, which lie on either side of the Mekong. Keng Hung is composed of twelve districts, or "pannas," and is sometimes called the "Hsip-Hsong Panna," or "the twelve districts." Six of these lie to the west of the Mekong, and six to the east. The latter portion is described as a pathless mountain tract, sparsely inhabited. The adhesion between the eastern and western pannas appears to be slight. The well-known Pu-Erh tea is grown on the left bank. At a hill called Pufang (in Burmese, Alanlegyat) = "four flags," it is said that Burmese, Tonkinese, Chinese, and Siamese devotees all erected pagodas to mark the meeting-place of four empires.

Keng Hung owned allegiance for many years both to Burma and China, and during part of the present century Burmese influence was

powerful. In 1878 Mindon Min appointed a prince as sawbwa* of Keng Hung, but he was unable to extend his influence over the trans-Mekong pannas, and eventually he was driven out, and a relative of the Keng Tung sawbwa installed. During Thibaw's reign, Keng Hung seems to have been practically independent of both Burma and China, till we recognized China's claims by handing the province over to her. In 1893 a Chinese governor, with a guard, installed himself in Keng Hung.

In Garnier's time the capital of Keng Cheng was at Mong Yu, on

WESTERN SHANS.

the western bank of the Mekong; but later the chief moved across the river, and established himself at Mong Hsing, of which we have heard so much of late.

Of the Cis Mekong States which are now under our control, Keng Tung, embracing most of the country lying between the Salwin and the Mekong, is, from its size, population, and geographical position as our frontier state, the most important. The present ruler is, moreover,

* Sawbwa = ruler.

connected by family ties with most of the other important Shan States. At one time the advisability of stopping our frontier at the Salwin was much considered and discussed, but was finally rejected. We could not, except on considerations of mere convenience, have stopped short there. The relations of the trans-Salwin Shan States to the kingdom of Burma, their connection with each other, the ties that bind them to the Cis Salwin States, the effect which our withdrawal or holding back would have on our prestige, the asylum which they would afford to malcontents and *mauvais sujets* of all sorts as an Alsatia whence they might safely intrigue against British interests and influence, and the danger of rulers and people forming other alliances if cast off from Burma, were considerations which proved too strong for the most cautious advisers of the government, and few will now dispute the necessity for, and wisdom of, our advance.

Dr. Cushing, a missionary and a great Shan scholar, visited these states while under the Burmese rule. He tells us that under this rule peace and quiet were seldom their lot. "Divide and govern" was the maxim which guided the policy of the Burman sovereigns towards their Shan dependencies. The sons of sawbwas were sent to the Court of Ava, partly as hostages for their fathers' good behaviour, partly to be trained in the way that they should go, the Burmese way, when they succeeded their fathers. The Burmese Government often fostered feuds which broke out between sawbwas, and left rival princes of one family to settle their claims to the control of a principality with the tacit understanding that the victorious claimant would probably be confirmed as sawbwa by royal appointment. Intestine troubles were frequently fomented by Burman intrigue when a prince seemed likely to become too prosperous for the safety of Burman authority. Bands composed of desperate characters were ever ready to avail themselves of the opportunity afforded by disturbances in any principality to murder and plunder, the result being that the people emigrated to some neighbouring state enjoying peace. Rebellions against the royal authority were always sooner or later ruthlessly suppressed, towns and villages being burned, and the country devastated. Dr. Cushing adds that the absence of permanent peace seriously affected the prosperity and wealth of the country. The Shan States, lying east of the Salwin, were, however, less obnoxious to Burmese oppression than those to the west of that river. When the Burmese troops were withdrawn from the Shan States to oppose our advance in 1885, anarchy reigned supreme, and for two years after our occupation of Mandalay, we had our hands too full in putting down dacoity and rebellion in the plains of Burma to turn our attention to the Shan States; but gradually, and with but little bloodshed, order was restored in the Cis-Salwin districts, the sawbwas submitted to the British Government, and their submission was genuine. Trans-Salwin Karenni was recovered from the Siamese,

and, with the assistance of the influential and loyal sawbwa of Moné, Keng Tung was peaceably brought under our rule.

At first, only one superintendent was appointed to the Shan States, but as our influence was extended, this was found too large a charge for one man, and the states were divided into the Northern and Southern Shan States, and each placed under a superintendent with several assistants, who exercise general supervision and control. The distinction between the Northern and Southern Shan States is purely an artificial one, and due to the different political circumstances in which they were placed immediately after the downfall of the Burmese monarchy. Except for the peace and general security now enjoyed, things have not altered very much. As before, each state is ruled by its own hereditary chief, who has the power of life and death, and absolute authority in his own state, so long as his rule is in accordance with the principles of justice and benevolence, and free from the oppression and cruel practices of former times. Certain sources of revenue are reserved by the Government, and the rest of the revenue is a lump sum levied on each state as tribute. To the devoted labours of our political officers, Messrs. Hildebrand, J. G. Scott, Captain H. Daly, and their able assistants, to their resourcefulness in emergencies, and their infinite tact and skill in dealing with both rulers and people, the Shan States owe their present peaceful and happy condition, and their increasing prosperity.

Mr. Pilcher writes thus of the Shans: "The Shans, or Tai, as they call themselves, are the most extensively diffused, and probably the most numerous of the Indo-Chinese races. Lapping the Burmese round from the north-west, they are found from the borders of Manipur (if the people of that valley have not been, indeed, themselves modified by Shan blood) to the heart of Yunan, and from the valley of Assam * to Bangkok and Cambodia. Everywhere Buddhist, everywhere to some considerable extent civilized, and everywhere speaking the same language, with little variation—a circumstance very remarkable amid the variety of tongues that we find among tribes in the closest proximity of location and probable kindred throughout those regions. This substantial identity of language appears to indicate that the Shans had attained at least their present degree of civilization before their so wide dispersion. The traditions of the northern Shans, as well as of the Siamese, speak of an ancient and great kingdom held by this race in the north of the present Burmese empire; and of these traditions the name of 'Great Tai,' applied to the people of that quarter, appears a slight confirmation."

* The Khamptis mentioned by Prince Henri d'Orléans are Shans. He says, "We are surprised to find in the Khampti country Thans, *i.e.* Thais, speaking the language of their brothers on the banks of the Mekong, using a writing similar to that which we find from the Canton river, from the middle of Yun Nam among the Pais, even to the mouth of the Menam."

Mixed up with the Shans we find a wonderful variety of more or less wild tribes. These various tribes inhabit the hills and wilder parts of the country, the Shans occupying the alluvial basins.

Rice is grown everywhere in the Shan States. There are two systems of cultivation, one on terraced and irrigated land, the other on the hillsides. The former is that adopted by the Shans. There are three crops; the first grown in dry weather on land altogether artificially irrigated by means of dams and huge waterwheels; the second on lands wetted by the first rise of the streams; the third and main crop during the rains. Very pretty little fenced-in gardens are common along the banks of streams flowing past villages. The Shans never use bullocks for ploughing, but buffaloes only. Their hills have been visited during

A KAW VILLAGE ABOVE THE MEKONG.

the past few years by the cattle plague, from which they suffered severely.

The largest cultivated plain, Cis Mekong, is that of Keng Tung, which, with the town itself, is deserving of some notice. This plain is about 10 miles long and varies in width, its average breadth being about 5 miles. The huge spurs from the high ranges on either side break up, as they descend into the plain, into gentle undulations. To the north and east the plain is perfectly flat and covered with rice-fields, intersected by irrigation channels; to the south are gently swelling downs and low grassy hills, swampy hollows lying between. The town of Keng Tung covers some undulating ground on the western side of, and overlooking, the plain. Its walls have a perimeter of some 5 miles; they follow the undulations of the ground, standing highest above the plains on the north, where a pagoda, with a curious umbrella-like tree growing from its summit, forms a striking landmark. The walls, which are somewhat ruinous, are crenelated and loopholed, and protected generally by a formidable ditch some 25 feet deep, and V-shaped—a very difficult object to negotiate at the best of times. Where the walls descend to the level of the plains the ditch disappears,

but marshes cover this portion. There are several arched gateways, protected by brick and earth traverses; one to the south gives egress to the road leading to a fine large tree called "Execution tree," where, under its spreading branches, executions used to take place on the large market-days. The prisoners were led through the crowds in the market, and given drink at the various liquor-booths.* A strong escort with bamboo ropes kept off the crowd. At the place of execution the name of the condemned man and his crime were read out by the official in charge of prisons, etc. (a court minister), and the slip of bamboo on which they had been written tossed over the man's head. He was then made to kneel down with his arms tied tightly at the elbows behind his back, and was decapitated with a long knife. The head was not held. This is evidently similar to the Chinese method.

There is very little level ground within the walls of Keng Tung, and only the northern and eastern portion of the space enclosed is built over; and even this portion is somewhat overrun with trees. There are several weedy swamps, the largest being Nong Tung, or the lake from which the town takes its name. The sawbwa's palace stands close by, and is a collection of fine teak buildings, well and solidly constructed, and surrounded by a brick wall. There are from 1500 to 2000 houses inside the walls, and these are substantially built, some with brick basements, the upper walls of planks or bamboo matting, some with the side walls of the upper story also of brick. They are roofed with small, well-made tiles, which afford protection against fire.

The monasteries and churches are very numerous, and each stands in its own walled enclosure, entrance to which is through a massive gateway, suggestive of the *Paifang* of China. The style of ecclesiastical architecture here differs considerably from that of Burma and the Western Shan States. In the latter the monasteries are all of wood, and built on piles, raising the floor to a height of from 5 to 6 feet. In the east, although the houses are all raised, the churches are built on the ground, with low brickwork walls, the upper portion being of wood, often richly painted and gilt. The roofs are tiled. The plan of a church is the same as we adopt—a nave and two aisles, with at one end the high altar, with its huge gilded figure of Buddha, with smaller figures in front, propitiatory- or thank-offerings of the pious villagers. The interior of the church is rich with carving, with effective mosaics of silvered and coloured glass, with frescoes, vermilion, and gilding. Votive offerings, in the shape of quaint umbrellas, large banners, and streamers resembling gigantic crackers hang from the roof; and a gorgeously carved and decorated pulpit is a conspicuous object. In March, 1893, when we were in Keng Tung, a two days' service was being conducted, and in the

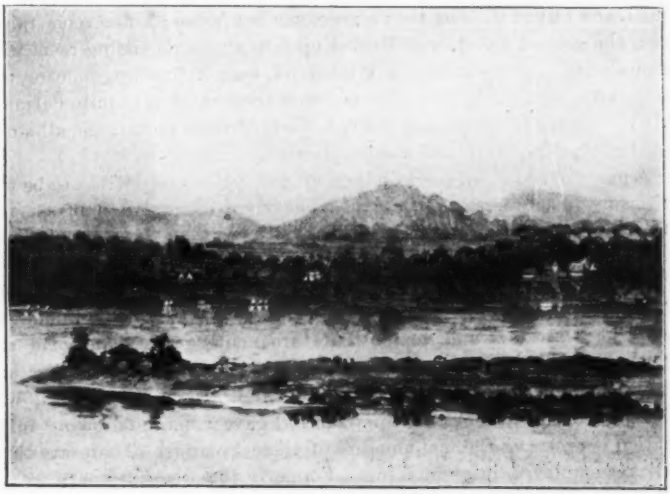
* Compare a scene depicted in an old print in the Scotland Yard Museum of prisoners halting to drink at the Baptist's Head, John Street, the day of removal from New Prison to Newgate.

royal chapel we found the aisles filled by people who were regularly camping there, among them some of the royal family, with the heir-apparent. They had their rugs and pillows, all appliances for chewing, pan, silver bowls, spittoons, and boxes, and many other household gods around them, and looked exceedingly comfortable. Around the church hung special offerings. Beautifully worked cloths by the queen dowager and princess of Keng Hung, to be placed over the image of Buddha, were on view; and around the altar a most miscellaneous collection of offerings for the church and clergy, from expensive silk robes to an empty Worcester sauce-bottle enclosed in wickerwork. The pulpit was a handsome temporary erection of bamboowork, covered with tinsel, coloured paper, etc., and harnessed to two very creditably constructed white horses, with gay trappings. In front of them, and at their feet, were pots of flowers and large-leaved plants; and extending down the nave in a double row were sets, each complete in itself, of gifts for the preachers, or readers would perhaps be more correct, who occupied the pulpit for about three-quarters of an hour each. This reading was continuous, and as each priest was relieved by his successor, he picked up his packet, containing a set of yellow robes, girdle, pair of slippers, umbrella, large palm-leaf fan, and pagoda-shaped lacquer box, and departed, so that the state of this line of presents gave an observant worshipper some idea of the progress of the service. However, the worshippers were not obliged to be present throughout, and the Keng Hung princess gave Mr. Hildebrand and myself an audience in the palace before we visited the church, which, with its lavish decorations, curious show of presents, the flowers, lights, and monotonous chant of the priests, gave us a quaint impression of assisting at once at a religious service and a fancy fair. The latter illusion was speedily and pleasantly destroyed by our not being asked to buy anything.

Adjoining the churches are well-built and comfortable clergy houses. The clergy in the Eastern Shan States are less orthodox than those in the west, and are called "Htu," or "imitation priests," by their stricter brethren. It is not unusual to see a priest riding in great state, with a cap on his head, and a long knife, or even a gun, slung over his shoulder.

I made many friends among the priests and their pupils while sketching their beautiful temples, and many were the games the boys had with a very intelligent terrier, who was never so happy as when hunting for some stick or stone hidden by his young friends. Many were the inquiries for my little dog when I revisited Keng Tung last year, and loud the lamentations at the news that he was dead. Among the inmates of the monasteries, the Chinese custom of allowing one nail to grow long, as a token of exemption from manual labour, is common. This nail is supposed to be useless, but I saw a little boy use it once as a spoon when tentatively tasting some preserve I had given him and his companions.

Many large and populous villages lie in the Keng Tung plain, and under its walls is a large colony of Shan Chinese, or Shan Talok. Theirs is an old settlement, and they have a handsome church of their own. Their houses are built of bamboo, and the village is very dirty, by reason of the goats, ducks, fowls, pigs, and cows which crowd the village street. They are good gardeners, and grow many good vegetables. They do a thriving trade, and are great workers in clay, supplying Keng Tung with most of the cheap pottery to be seen in the bazaar. Cloths, tinned milk, and matches are procurable in the shops in Keng Tung; and, besides three small market-days, on every fifth



KENG KONG.

day a big market is held, when the large open space within the east gate is thronged by a motley crowd, representing all the various tribes from the surrounding country. The quantity of goods displayed and their variety are very great; they include English and Indian cotton goods and yarns, Manchester silks, gaudy handkerchiefs, aniline dyes, Japanese matches, powder and caps, needles, etc. Chinese merchants sell large straw hats with oiled silk covers, raw silk, fur coats, iron pots, quicksilver, and rock-salt. The Chinese are also the butchers and shoemakers. The country women bring to market excellent cheap oranges, various fruits, and vegetables. A great trade is done by the liquor shops (shamshu); and the restaurants, where hot cooked food is sold, are well patronized.

The Shans have a very simple still—a wooden cylinder, with a false bottom of wickerwork, stands in an iron boiler with a packing of cloths

over a fire. On the top is a copper pan with another packing of cloth where it rests on the cylinder; beneath this pan, suspended by threads and weights hanging outside the cylinder, is a small wooden saucer, with a spout passing to the outside. On the wicker bottom a sticky kind of rice with balls of rice flour and certain jungle leaves pounded together are placed, and the fire lighted. The copper pan is kept continually full of cold water. The spirit passes up from the rice, etc., in the form of steam, and is condensed on the bottom of the copper pan, whence it drips into the saucer, and flows out through the spout into the bamboo placed to receive it. I saw one of these under a house in Mong La. A lady was superintending operations, and gave me some of the spirit, and I liked it. She then showed me her house; a fine room, raised from the ground 8 feet, was divided up into a general sitting-room with several little sleeping-cabins matted off, each containing one or two bed places, with their dark blue and somewhat thick musquito curtains. Above was a loft containing many household implements. Small stools stood in corners and round the fireplaces.

Time and space fail me to tell of all the various hill tribes to be met with in this interesting country. The mere enumeration of some of them will show how impossible this would be; *e.g.*, we have the Kaw, Kui, Kun Loi or Tai Loi, Miao, Muhso, Palaung, Lanten, Taungthu, Wa, Yang Sek, Yang Lam, Yao Yin, and others. Of these, the Palaungs are scattered over all the Shan States. They are Buddhists, and their "wats" and temples are frequently very handsome and elaborate little buildings. They are the gunmakers of Keng Tung; and Captain Walker, D.C.L.I., of the Indian Intelligence Department, who did much excellent work on this frontier, gave me the following information concerning the manufacture of these firearms. There are three villages employed in gunmaking. Formerly the weapon was merely a gaspipe with a flint lock. Now the pattern adopted is the Tower musket for percussion-caps. Pistols of the same pattern are also manufactured. The barrel is made of iron bar, and the bore drilled, the exterior being then worked down and smoothed on a grindstone until round and polished; the touch-hole is also drilled. The barrel is then fixed to a block of wood, which is afterwards shaped into a stock. The locks are fitted on last. They are sold for 9 to 12 rupees. They are not very safe weapons for the owners, as a sepoy discovered to his cost. Borrowing a gun, which Captain Walker had bought for his interpreter, to go and shoot doves, he nearly blew his hand off at the first shot, the gun bursting close to the breech. The material of the guns is very inferior, and the man probably used too large a charge.

Captain Gordon, who was at work on the survey of the Western Shan States, tells us that there are over twenty tribes, distinct in dress, customs, and often language, to be found in the country west of Fort Stedman. Like all the people of these hills, they are unambitious and

unenterprising, but cheerful and fond of amusement. The wife does all the housework and a large share of the outdoor work as well. At a Taungthu village, which had suffered from the cattle plague, I saw a woman dragging the plough, which her husband guided.

The Muhso * is another largely scattered tribe, broken up in several subdivisions. They came originally from China, and many are still to be found there. There is said to be an independent Muhso king beyond Keng Hung northwards. There are two great divisions of Muhsos—the Red and the Black, these terms being supposed to refer to the difference in dress. In both the general colour is dark blue, very nearly

MONASTERY, PUNG PYIN.

black; but the sleeves of the jackets and legs of the trousers of the Red Muhso men are ornamented with red and white rings.

Their religion consists in a belief in one great spirit, and many lesser spirits of the groves, streams, hills, rivers, forests, etc., to whom offerings of rice and vegetables are made. Even among this simple people we find the *odium theologicum*, for the Red Muhsos accuse their Black brethren of heresy in offering meat, as well as rice and vegetables, which is abomination, while the Black Muhsos accuse the Red of offering to unorthodox spirits.

Captain H. R. Davies, O.L.I., also a valuable officer of the Indian Intelligence, a great linguist, accompanied me on my first visit to a Muhso village. He had an attack of fever, and had to shut himself up in his tent as soon as it was pitched. Shortly after, the Muhso chief, aged about ninety, came to see us with offerings of forbidding-looking chunks of pig. One of these, he explained, was especially intended for Captain Davies. I said he was ill, but that I would give it to him when well enough. I suppose I did not look honest, for I soon saw a man engaged in hanging this hideously untempting, hairy piece of pork to a tree-stump just outside Captain Davies' tent door, at the height of his eye,

* It has been said that this word is the Shan word = "hunter," and that these people are so called from their reputation as hunters.

so that he would catch sight of it the moment he emerged; the result was a relapse on the patient's part.

The Muhsos have a curious annual festival on the Chinese New Year's Day. It lasts about five days. During this feast no stranger is allowed into the village, bamboo gateways and symbols being erected along the paths to the villages, to warn him off. This custom is well known and respected by Shans and Laos. I had a camp in a village once, from which I moved to a hilltop near. On my return, during this season of "Taboo," I found an excellent path cut round the village. As I could not pass through the village, the villagers had been good enough to facilitate my journey round it. I found them always pleasant and civil; they would sit round the camp fire in an evening when I had tea, and in return for biscuits and sugar and a display of mechanical toys, would give me selections from their national airs, on their curious little instruments of two kinds; one, a gourd with bamboo pipes plastered in with beeswax, each pipe having a small metal tongue let into it. The sound is soft and low, rather like a harmonium softly played. The other instrument is a kind of Jew's harp of split bamboo, and not an easy thing to perform on.

I saw a very curious sight at the burial of a Yang Lam chief. Halting one midday for breakfast under a big tree, by a small lake lying at the foot of a frowning limestone cliff, I noticed many young men bathing on the far side, while nearer many women and girls were washing their long hair. Inquiring the meaning of this, I was told they were on their way to a chief's funeral, and this washing was a necessary preliminary—probably only because they had travelled some distance. I went up with them to the village, where many camp kitchens, in pretty groves of trees, furnished a plentiful repast of rice, stewed vegetables, and buffalo-hide to all comers, including myself and attendant interpreters. When all was ready, a gaily decorated coffin, containing the deceased, was carried out and placed on a heavy wooden sleigh, and a gorgeous canopy, of gold and coloured paper and tinsel, placed over it. Two long bamboo ropes were attached to each end of the sleigh, and to these about two hundred men and boys, women and girls, harnessed themselves. The head-men waved their big straw hats and cried, "Pull for your lives," and a regular tug-of-war commenced, and the corpse was dragged up and down hill, over the uplands and into the swampy hollows, a rope breaking now and then and upsetting all its pullers, who went tumbling over each other downhill among the bracken, amid much merriment. This lasted two or three hours till sunset, when the coffin was lowered into a grave, dug under a wide-spreading tree, by which several yellow-robed priests had been solemnly sitting; a few prayers were said, exhortations given, and presents offered to the priests; the grave was filled in, the gorgeous canopy placed above it, and the mourners (save the mark!) departed.

I could not find out what this ceremony signified. I have an idea that it originally symbolized the struggle of the powers of good and evil for the dead man's soul.

The inhabitants of the Shan States suffer from fever in the low-lying valleys, and small-pox is an ever-present scourge, as the disfigured faces of too many Shans evidence; influenza also has, I believe, invaded even this distant and uncivilized tract.

My party has been fairly healthy generally during our survey work in the Shan hills; but every one has not fared so well, and it was with the greatest regret that I learnt from M. Pavie, in November, that Captain Riviere died, after much suffering, on the Mekong, in May, on his way down from Luang Prabang. He left us in March at Keng Kong, and was very ill then. He had charge of the survey operations with M. Pavie; and he and I necessarily saw much of each other at first, and I formed a sincere friendship for him, which, I am pleased to think, he reciprocated. He was a pleasant companion, enthusiastic about his work, and eager to pick up anything new to him which the system of the survey of India, which he held in admiration, could show him. He had done much excellent work with M. Pavie on previous missions, and had been decorated for his services. He is a loss alike to science and the French army.

We were able to carry very good triangulation across the Shan hills to the east of the Mekong, where we joined on to the peaks fixed by Mr. J. McCarthy during his splendid work in Siam, of which I cannot speak too highly. His assistants were Siamese trained by himself.

I cannot close without urging again, as I did at the Society of Arts, the loss to ethnology if the language, manners, and customs of the many interesting tribes I have referred to are not studied carefully and soon by some one competent for the task, and willing to devote some time to the work. Travellers may collect and give to the world of science many interesting facts and much valuable information, but at best their researches can only be superficial. In the words of my friend Mr. Warry, adviser on Chinese affairs to the Government of Burma, "The chance of studying these peoples to full advantage is fast slipping away. Up till now they have been almost entirely isolated, owing to the insecurity which has prevailed in the regions where they are settled. In consequence, they have, no doubt, preserved their languages and institutions in a far purer state than members of the same races who have lived under happier and more peaceful conditions elsewhere. Now, however, an era of peace seems to have set in. These tribes are in constant contact with the outside world; their languages are undergoing modifications, or dying out, and their customs are being assimilated to those of the Shans and Chinese. Many illustrations of this have come under my observation during the past half-year. I would therefore recommend any one who is interested in such inquiries to come

before it is too late; the inducements are surely sufficient: a good climate, in the midst of splendid mountain scenery, simple, friendly folk to live among, and an occupation full of interest in itself, and sure to lead to results of permanent value."

Before the reading of the paper, the PRESIDENT said: It is scarcely necessary for me to introduce Colonel Woodthorpe to you, because he is so extremely well known as an adventurous and very able surveyor and explorer. It must be now upwards of a quarter of a century ago since he surveyed the Nago and Garo hills, and published that charming account of the Lushai expedition, and since that geographers have watched his career, sometimes in the extreme East in Sadiya, sometimes attempting to solve the question of the Brahmaputra by ascending the Dipong, then in the Kuram field-force with Lord Roberts, again in the Pamirs, in Wakhan, with my old friend Sir William Lockhart, and again in his old ground Sadiya, and exploring the upper tributary of the Irawadi. Now at last, for the second time, I think, we have him with us in the flesh, and I am sure you will all give him a very hearty welcome.

After the reading of the paper, the following discussion took place:—

Sir RICHARD CAMPBELL STEWART: It is a great honour to me that the President should have called upon me to enter into the discussion this evening, for which I was scarcely prepared. I can, however, reflect the feelings of the audience here in having heard the interesting lecture from Colonel Woodthorpe. I have had the honour of meeting Colonel Woodthorpe in Burma, and on former occasions have heard of his very interesting explorations with other officers. I have had the opportunity of meeting a friend of Colonel Woodthorpe's on a former occasion of exploration, and I can only mention the extraordinary exertions of those officers who have made this most interesting exploration, and it must have been satisfactory to those with whom Colonel Woodthorpe served, to know that their explorations were of the greatest value to science and the country. In regard to these Shan States, on which Colonel Woodthorpe has given us so interesting a lecture, I can only say that I perfectly agree with him in all that he has said regarding their character and their interesting language. There is only one point on which I can say I am competent to judge, and that is as regards their qualifications and usefulness hereafter as soldiers in the army. It was said, during the time that I had the honour to command in Burma, that the Shans were not a fighting race. I can recollect, however, that the officer who commanded the Burma Sappers informed me that he was then enlisting many Shans, who were turning out excellent soldiers, and who had many military instincts, which he thought would be exceedingly valuable to the country hereafter. That is the only point upon which I think myself competent to form an opinion. If I may be allowed, I would say that Colonel Woodthorpe's explorations have been of the greatest value to science, and I am sure that you will acknowledge with me the pleasure we feel in the interesting lecture he has given us this evening.

The PRESIDENT: We are so fortunate as to have present here this evening a political officer in Mr. Scott, who is very intimately acquainted with these Shan States, and I therefore trust that he will favour the meeting with a few remarks.

Mr. J. G. SCOTT: Colonel Woodthorpe has charmed your eyes and your ears so completely to-night, and has given us so succinct, so general, and so comprehensive an account of the Shan States, that I feel myself rather in the position of the gentleman at the Mansion House, whose jokes had been used up in the speech before his, or of the young lady whose favourite song had just been sung by some

other young lady. It was, therefore, with some gratification that I discovered a mistake. It is not Colonel Woodthorpe's fault, and, moreover, the mistake is a very venial one. He states that the Muhso, one of these tribes whose names he rushed over—and they are not easily remembered—are so called because they are hunters. That is not exactly true. Muhso is not the Shan word for "hunter," although the idea is that Muhso does mean "hunter." Mokso is the Burmese word for "hunter," and the Burmese interpreters, who have to be used by most officers who have not time to learn Shan or Burmese, tell these officers that *muhso* means "hunter," and these people are hunters. As a matter of fact, they are very great at the crossbow, which they use with or without poisoned arrows. I remember on one occasion beating the jungle with a lot of these Muhso. We got nothing, because the jungle was too dense; so, when it was all over, we collected them, and held an archery meeting. We began at 22 paces, by getting these men to fire bamboo darts at eight-anna pieces; this was too expensive, and we reduced the mark to two-anna pieces, and then had some remarkable sport. I think you will find very few marksmen who would hit a two-anna piece at 22 paces with a revolver. Another point is, that it is hardly correct to say that during the Chinese New Year no one is allowed to go into their villages, because I have spent the whole of a Chinese New Year in the village of one of these chiefs. The Muhso chiefs are rather interesting, and the only personages I can compare them with are the Lamas of Tibet. The head-man of this particular village had to be worshipped during the New Year, and, unfortunately, we marched into the village on the eve of the New Year, so that he could only give me for political work, to discuss matters, what time he could spare from being worshipped. He would go to the population, who would come and offer up prayers, and then he would come over and discuss matters. During the New Year they behave much as the Chinese. They burn postal orders to the lower world, in the shape of slips of gold leaf, in the temple, fire off guns, and beat gongs. It is not that people are not allowed to go into the village on that occasion, but if they did it, they would soon leave, for what with the gongs, firing of guns, burning of crackers, and so forth, it is a noisy place to be in. There is a great number of other hill races among the Shan States, who are very interesting, and I hope some one will have the time to make a study of them.

The Shans themselves are well worth studying. Unfortunately, none of the officers there have had time to study their customs and habits. I may allude to one thing which seems interesting. They have a system of tenure which much resembles some of the feudal systems of tenure. For example, one very like socage—villagers holding land on condition of rendering some service to the sawbwa. In Ho Kut, for instance, they hold their lands free on condition of supplying the sawbwa with orchids. Another village of seventy or eighty houses had their lands free on condition of cutting grass for the sawbwa's ponies. Others came to look after the sawbwa's ponies. Then there was another case like petit sergeanty, villagers holding their lands on condition of supplying swords and gun-barrels. The Shan States grow a good deal of produce, which will become valuable. Perhaps you would like to know something of how the country is going to be opened up. A great deal has been talked about different lines of railway through the Shan States to Yunnan. I don't want to bore you, but the man who has been there is usually a great bore. We see an exception occasionally; Colonel Woodthorpe is a notable exception. I am the bore. The man who has not been there, or within 500 miles of there, and talks as if he had been there, is not only a bore, but a nuisance. We have been told that the Burma-Karenni railway is very feasible. Running up the banks of the Salwin to a point at the bend of the river about 19° N., the railway is supposed to get to the point

where the Nam Teng flows into the Nam Kong. It then follows the eastern bend, till, we are informed, it is only 40 miles to the Nam Kok flowing into the Mekong. In these days of photographing the money a man has or has not in his purse, it is difficult to say that anything is impossible; at any rate, this is too expensive to be done. There is a story I am fond of telling, I don't know whether you have heard it. It refers to the difficulties of the Shan roads. You have to climb up 4000 or 5000 or 6000 feet over what is like a ruin, and people going to the Shan States ought to be Alpine climbers. When first I went up with European soldiers, on getting to the top, one said, "Is this the Shan tableland, sir?" I said, "Yes." He said, "Well, then, we've been climbing up the blooming legs." The range is of the worst possible character of legs, and is 6000 feet high. In Europe tunnels would be driven through it; it is not likely with this railway, and it is absolutely unfeasible. With regard to the Kunlon line, it is asserted that at the Kunlon ferry the railway lands one in a *cul-de-sac* of the hills; this is absolutely inaccurate. When you get there, the country beyond is easier than before. It is practically absolutely certain that the railway can be taken on from the Kunlon ferry to Shunning-Fu, and from there it is nearly certain that the line can be carried down a stream to the Mekong, and from there again to Talifu, if the Chinese will allow it to be built. I am afraid I am wearying you, but I have only to regret that the picturesqueness of Colonel Woodthorpe's lecture has deprived me of much I should have liked to have said, and driven me to rather dull subjects.

The PRESIDENT: It only remains for us to thank Colonel Woodthorpe for having given us so interesting an account of the country, at present of extreme interest to Englishmen, and of which at present we know very little. We have also to thank Mr. Scott for the observations of great interest which he has made on the subject. We have had the very great advantage, not only of receiving this account from Colonel Woodthorpe, and his very full account of the manners and customs of the people, but we have to thank him also for the beautiful illustrations of his paper. I am quite sure you will all instruct me to return Colonel Woodthorpe our very cordial thanks for his paper.

THE WATERWAYS OF ENGLISH LAKELAND.*

By J. E. MARR, M.A., F.R.S., Sec. Geol. Soc.

I.—INTRODUCTION.

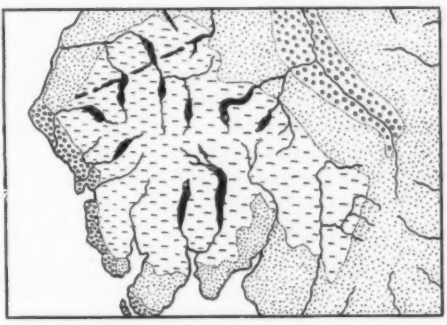
THE attention of geographers has recently been directed to the English Lake District by Dr. H. R. Mill, whose paper on a "Bathymetrical Survey of the English Lakes"† is valuable alike to the geographer and the geologist. In that paper the configuration of the district is briefly described, the radial symmetry of the stream-lines noticed, and the former existence of a vanished dome of rocks over the area maintained. The cause of the radial symmetry alluded to above has been discussed by many writers, but it will be convenient to add some further observations upon it in the present communication, which is

* Paper read at the Royal Geographical Society, March 23, 1896. Map, p. 688.

† *Geographical Journal*, vol. vi. pp. 46 and 135.

more especially devoted, however, to a discussion of the causes which have tended to produce deviations from the general symmetry of the stream-courses. A discussion of this character affords an excellent illustration of the manner in which study of stream-lines throws light on former events in the physical history of a country, and the results obtained from a limited district are applicable over much wider areas.

The earliest writer, so far as I am aware, who called attention to, and attempted to account for, the radial stream-system of Lakeland, was Mr. W. Hopkins.* He observed that the dip of the Carboniferous rocks, which form a broken girdle around the district, is sufficiently high to allow of their having risen far above the present surface, composed of pre-Carboniferous rocks; and gave reasons for supposing that



MAP OF THE LAKE DISTRICT, SHOWING RELATION OF RADIAL DRAINAGE TO GEOLOGICAL STRUCTURE.

PERMO-TRIASSIC ROCKS. CARBONIFEROUS ROCKS.

SILURIAN, ETC., ,, AXIS OF SILURIAN, ETC., ROCKS.

they actually did extend over the earlier rocks, which had been folded and denuded before their deposition, and that the radial drainage was originally outwards in all directions from the centre of the somewhat irregular dome produced by the elevation of the Carboniferous rocks, though the radial cracks which he considered necessary to give the initial direction to the drainage were probably of little importance in that respect. The existence of Carboniferous rocks over the old slate rocks occupying the Lake District proper is also inferred by Mr. Aubrey Strahan,† on account of the trend of the rivers. He remarks that "at the time the rivers began to flow, the Carboniferous rocks extended up the whole platform, of which the present hills and watersheds form remnants, and that the courses down the slopes of these

* "On the Elevation and Denudation of the District of the Lakes of Cumberland and Westmoreland," *Quar. Jour. Geol. Soc.*, vol. iv. p. 70.

† *Mem. Geol. Survey*, "The Geology of the Country around Kendal, Sedbergh, Bowness, and Tebay," by Messrs. Aveline, Hughes, and Strahan, 2nd edit., 1888, p. 2.

rocks, once initiated, were kept and deepened by the rivers, while the Carboniferous rocks were being denuded back into their existing scarped outcrop." The same reason for the radiate symmetry of the streams was given by the present writer,* in an article in which he suggested a cause for the formation of the dome, and a somewhat late date (geologically speaking) for its production. To these questions I would refer briefly here. The movements which produced the Pennine chain are generally admitted to have been in operation during the deposition of the New Red Sandstone rocks which occur in the Eden valley, which were deposited in a trough between the Pennine uplift to the east, and that of the Lake District area to the west. The latter, however, at this period does not seem to have been of such a nature as to produce a dome, but rather an anticlinal fold, continued in a northerly direction through Kirkcudbright and Ayr, having the northerly continuation of the Pennine fold running parallel with it to the estuary of the Clyde. Between these two anticlinal folds lies the Ayrshire coalfield, with the New Red Sandstone overlying it, and also the New Red Sandstone patches extending from the Eden valley up Nithsdale and Annandale. Passing to the east side of the Pennine chain, we find the Liassic rocks dipping eastward at such an angle that they ought to rise far above the Eden valley, and yet a patch of Lias (or more properly Rhætic) beds occurs near Carlisle, indicating subsequent movement about the position of the Pennine chain. Now, the Liassic beds of Britain were covered by a great thickness of Mesozoic sediments, so that the Rhætic deposits of the neighbourhood of Carlisle were probably covered by thousands of feet of Upper Mesozoic and possibly Early Tertiary strata. It is true that extensive movements of upheaval occurred in Britain in the early Cretaceous times, but we have reasons for supposing that Cretaceous rocks also extended over the area under consideration at one time. Moreover, the Lake District uplift is in the form of a dome, and regular dome-shaped uplifts, having a symmetry like that possessed by the Lake District dome, are produced, as far as we know with certainty, in one way only, by intrusion of a lenticular mass of igneous matter beneath, forming a laccolite.† Subsequent to the deposition of the New Red Sandstone of Britain, we have no evidence of intrusion of igneous rock until early Tertiary times, when the intrusions of plutonic rock occurred in Skye, Rum, Ardnamurchan, Mull, and Arran, *in a line which, if continued southwards, would pass beneath the Lake District.* The somewhat meagre evidence at our disposal points, therefore, to the possibility of the elevation of the Lake District dome having taken place during the middle Tertiary period of disturbances which produced such marked results

* *Geological Magazine*, December 3, vol. vi. (1889), p. 150.

† See Gilbert, 'Geology of the Henry Mountains.'

over a great part of Europe, and of the drainage having been impressed, not on Carboniferous rocks, but on overlying Mesozoic and perhaps Eocene rocks, which have been completely denuded from off the region around Lakeland, with the exception of the significant patch of Rhætic rocks near Carlisle. I have laid particular stress upon this point, because the occurrence of very old rocks in the heart of Lakeland and similar districts has often led geologists to assign a great antiquity to the river-systems of these districts; whereas, if the above inference be correct, the initiation of the drainage of the district is almost carried out of the domain of the geologist and into that of the geographer. There is nothing startling in the view that the Lakeland valleys have been entirely excavated in Tertiary times. The amount of denudation is quite insignificant when compared with that which has taken place amongst the basaltic plateaux of the western isles of Scotland.*

Whatever be the date of initiation of the drainage, and whatever the age of the rocks over which the waters first flowed, it seems to be generally admitted that this drainage was superimposed upon these once existent rocks, which have long since been denuded from the centre of the district, and that on this account the centre of radiation of the river-system has no connection with the axis of uplift of the Lower Palæozoic rocks which now occupy the Lake District proper, the former being indeed situated on the Scawfell group of hills, whilst the latter runs in an east-north-east to west-south-west direction through the Skiddaw group.†

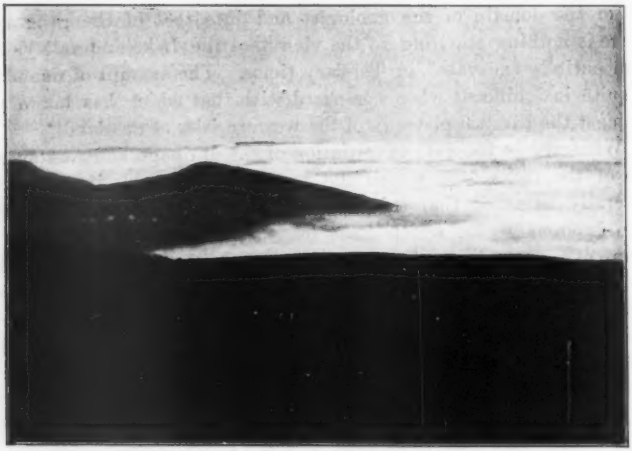
II.—The Initiation of the Lune and Eden.

As all the streams of the district flow into the sea or into the rivers Lune and Eden, we may conveniently consider the district for our present purpose as bounded by these physical features, and it is necessary, therefore, to discuss the origin of the two rivers mentioned above. As regards the Eden, though the actual river-valley is one of erosion by the river itself, the great depression between the northern half of the

* The Tertiary date of the final emergence of the Lake District has also been maintained by Mr. J. G. Goodchild (see *Transactions Cumb. and West. Assoc. for Advance of Lit. and Sci.*, 1888, p. 89).

† A good example of superimposed drainage in a district in which the overlying newer rocks have been almost but not quite removed by subsequent denudation, is furnished by the country around Prague. The Moldau here cuts right through the complicated basin of Lower Palæozoic rocks, which extend from Prague in a west-south-westerly direction, and many of its tributaries, such as the Beraun, have cut deep gorges into these rocks. Although these gorges are entirely cut into the old rocks, patches of Cretaceous rocks are found extensively on the plateau through which the rivers have eroded their valleys, and there is no doubt that the drainage of this part of the Moldau river-system was superimposed on late Mesozoic or Tertiary rocks. Had the Cretaceous rocks been entirely removed, there would be no indication of the (geologically) late date of formation of the valleys, and their nature might have led some to suppose that they were commenced at a very remote period.

Lake District and the Pennine chain forming the basin of the Eden, and spoken of conveniently by Mr. Goodchild as Edenside (the term "Eden valley" being retained for the actual valley of erosion of the Eden), is primarily due to Earth-movement having let down the soft New Red Sandstone rocks between the more durable Carboniferous rocks which bound them on either side, and the resulting greater denudation of the softer rocks.* The history of the Lune is different. Physically, the source of the Lune is that of the Birkbeck, which rises on the ridge



VIEW OF EDENSIDE, LOOKING TOWARDS WILDBOAR FELL AND THE HOWGELL FELLS FROM HIGH CUP VALLEY, NEAR APPLEBY. EDENSIDE IS DEFINED BY THE CLOUDS.
(*E. J. Garwood, photo.*)

of Shap Fells at a height of a little over 1000 feet above sea-level. This stream flows over carboniferous rocks for a distance of about 6 miles south through an open valley, and then enters a gorge at Tebay, with the high Howgill Fells rising on the east side, and fells almost as high on the west, both groups being composed of Lower Palæozoic rocks. The line of junction of the Carboniferous and Lower Palæozoic rocks at this place must have been far above that at the source of the Birkbeck, and there is little doubt that we are dealing with a case of what Gilbert terms "antecedent drainage;" in other words, that the uplift of the Howgill Fells took place after the initiation of the Lune drainage, but that the erosive power of the river was sufficient to keep the waterway open during the rise. This explanation of the Lune gorge is offered by Mr. Strahan. It is interesting to find a simple case, analogous to that which we are considering, described by Gilbert in his 'Geology of the

* The views illustrating this paper are from photographs by my friend E. J. Garwood, Esq., M.A., F.G.S., to whom I am indebted for permission to reproduce them.

Henry Mountains.' The laccolite called Mount Holmes consists of a "greater arch" and subsidiary "lesser arch" respectively, comparable to the Lake District dome and the Howgill Fells. "The crest of the greater arch is the centre of a radiating system, but the crest of the lesser arch is not; and waterways arising on the greater traverse the lesser from side to side. More than this, a waterway, after following the margin of the lesser arch, turns towards it and penetrates the flank of the arch for some distance. In a word, the drainage of the greater arch is consequent on the structure, while the drainage of the lesser arch is inconsequent.*

It will be evident to geologists that the uplift of the dome of the Howgill Fells was accompanied by the formation of the great "Dent fault," which runs to the east of these fells; and accordingly, if the Lune were initiated before the uplift of the Howgill dome, we should

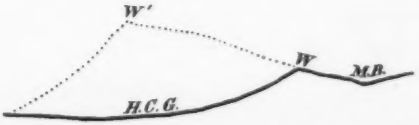


DIAGRAM-SECTION THROUGH HIGH CUP VALLEY. H.C.G. HIGH CUP GILL; M.B. MAIZE BECK; W. PRESENT WATERSHED; W'. ANCIENT DITTO. THE CONTINUOUS LINE SHOWS THE PRESENT SURFACE, THE DOTTED LINE THE ANCIENT ONE.

expect that some of its tributaries had commenced to flow before the final movements, at any rate, along the line of the Dent fault. Accordingly, Mr. A. Strahan, in the Memoir of the Geological Survey already quoted† (p. 2), remarks that "it may be supposed that those tributaries of the Lune which cross from the downthrow to the upthrow side of the great fault have retained and deepened valleys which were commenced before the fault existed, the erosion keeping pace with the upheaval on the upthrow side."

Before discussing the minor complications of the radial drainage of the Lake District, some of the complications of the Edenside waterways may also be noticed. The Pennine chain is a broken anticline, whose axis lies some way west of the present watershed. The watershed, as maintained by Goodchild, lay further west, and was probably originally over the axis of the uplift; but, as the anticline has a steep western and gentle eastern limb, this watershed would, according to the law of unequal slopes, gradually work eastward, with the result that the upper feeders of the Tees are gradually being "beheaded," and their headwaters diverted into the Edenside basin. An admirable example of this is seen in the case of High Cup Gill, east of Appleby.

* G. K. Gilbert, 'Geology of the Henry Mountains,' p. 140.
† *Mem. Geol. Survey, loc. cit.*, p. 2.

High Cup Gill runs at the bottom of a deep gorge cut through the Lower Carboniferous rocks and intrusive Whin Gill, to emerge into the wide depression of Edenside at the farm of Harbour Flat. On reaching High Cup Nick at the head of the valley, a gentle valley is found sloping down to Maize Beck, a tributary of the Tees, and a stream runs down here over a limestone, known as the Tyne bottom limestone. Looking westward, it is seen that this valley once extended considerably further to the west, its bottom there also being determined by the Tyne bottom limestone; but it has been cut into by the High Cup stream having a greater corrasive power, so that we find the westerly flowing

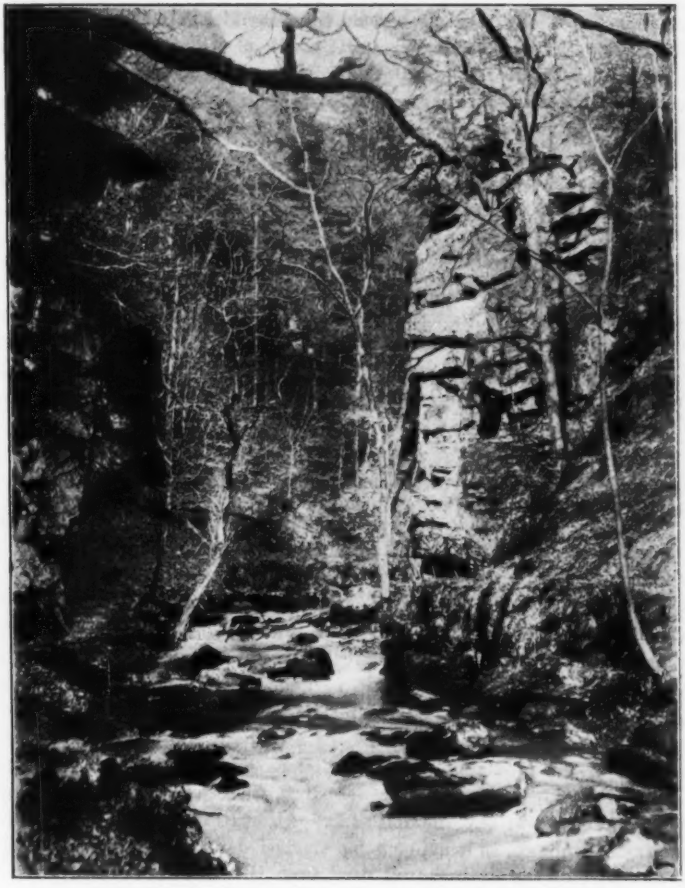
HEAD OF HIGH CUP GILL, SHOWING OLD VALLEY ONCE RUNNING TO MAIZE BECK CUT INTO BY HIGH CUP GILL (THE DISTANT MIST LIES ABOVE MAIZE BECK, THE NEAR MIST ON HIGH CUP GILL. BETWEEN THESE IS THE SURVIVING RELIC OF THE OLD VALLEY, PORTIONS OF WHICH ARE ALSO SEEN ON EACH SIDE OF THE HEAD OF HIGH CUP GILL, THOUGH COVERED BY LANDSLIP IN THE IMMEDIATE FOREGROUND).

(*E. J. Garwood, photo.*)

stream at the bottom of a gorge which has been cut out of the easterly sloping valley, the remnants of which are, however, easily detected. In time, the head of the High Cup valley will recede to Maize Beck, when this important stream will be diverted into the Eden drainage, as has already occurred to the minor runnels now flowing into High Cup gill.*

* A case where the head of an important stream has actually been diverted in this manner in the Lune basin has been described by Mr. Strahan (*Mem. Geol. Survey, loc. cit.*, p. 45). The head-waters of the stream flowing through Uldale in a northerly direction have been diverted to the west, owing "to the cutting-back action of the head-waters of Carling Gill."

The occurrence of gorges, presenting, on a small scale, the structure of cañons, the steepness of whose sides is clearly not due to small rainfall in this wet region, may be here noted. There are two well-marked types of gorge in Edenside; the first occur in the mountain-limestone



NUNNERY WALKS (A STEEP-SIDED RAVINE IN SOFT SANDSTONE).
(*E. J. Garwood, photo.*)

of the Pennine escarpment. A good example of this type is seen in Scordale, some 5 miles east of Appleby. This and similar gorges in the district owe their steepness to the prominent "master-joints" of the limestone, and also to the percolation of the rain into the porous limestone, the latter effect producing results similar to those which occur in

regions of slight rainfall. In the second type of gorge, well illustrated by the valley through which the Croglin water flows past Nunnery Walks between Armathwaite and Lazonby, the streams have eroded steep-walled valleys out of soft rock. The rock, a red sandstone, is far from durable, as shown by the projection of hard ribs to the extent of an inch and a half in places beyond the general level of the rock in the artificially cut caves of Eden Lacy, south of Kirkoswald, which were excavated between 1790 and 1836, indicating the destruction of at least an inch and a half of rock, mainly by wind, in a hundred years or less. The Croglin gorge apparently owes its steep sides to the increase in the declivity of the stream, produced by the comparatively rapid lowering of the bed of the main river, the Eden, which flows past the end of the gorge.*

The drainage-lines of the Eden and Lune valleys having been established, those of the central part of the Lake District were next developed, the streams of the east side of the district being then (as now) tributaries of the Eden and Lune respectively, whilst those of the west probably entered tributaries of the great subaerial valley which once occupied part of the site of the present Irish Sea west of the Isle of Man, as indicated by a continuous tract of deep water now occurring in that position.

III.—Initiation of the Radial Drainage and Early Changes.

The general drainage of the central part of the district having been impressed upon rocks which have since been denuded, it is only occasionally, and as the result of "accident," that the main valleys coincide with fractures of the strata. The independence of the major valleys and lines of fracture is well seen in the case of Windermere, across which the strata run with no break; while just west of the head of Windermere, an enormous fault is unaccompanied by any marked physical feature, it having only determined the trend of a minor cliff for a short distance, owing to the apposition of hard and soft rocks. Subsequent to the production of the radial system of stream-courses, and before the changes about to be described, there were probably several important changes; one, the uplift of the Howgill Fells, has already been mentioned, though, as it happens, no marked deviation in the direction of any part of the drainage resulted from it. Elsewhere it may have been different. The southerly flow of the Glenderamackin Beck towards the centre of the district is noticed by Dr. Mill, and I shall presently allude to the probability of the upper waters of the Caldew having once

* Similar cañon-like gorges in the heart of the Lake District, such as Peers Gill, near Wastdale Head, are noticed below. They are due to prominent joints, faults, and dykes of igneous rock traversing exceedingly durable volcanic rocks. It is interesting to find them close to Seathwaite, which bears an unenviable reputation for rainfall.

joined those of the Glenderamackin, thereby rendering this anomaly still more marked. Any one standing on the top of Mell Fell, which looks over the Glenderamackin and Caldew depression, will be at once impressed with the idea that at one time a valley ran from Mell Fell northwards towards the plain; and it is possible, at any rate, that the elevation of the Skiddaw, like that of the Howgill group, was posterior to the general uplift of the dome, but unlike the case of the Howgill Fells, that the Skiddaw uplift was sufficiently rapid to pond back the head-waters of the old valley and divert them southward, producing a watershed to the west of Carrock Fell.* Other minor changes may have occurred in pre-glacial times, but they have not been sufficient to complicate the general radial symmetry to any great extent, unless the origin of the Ullswater drainage far east of that of most of the main valleys be due to beheading of its upper portion (for it is possible that the waters of the upper part of the Wythburn valley, when at a higher level, may have flowed through the depression between Helvellyn and Fairfield, and so down the Grizedale valley to Ullswater); but it is more probable, as suggested by Hopkins, that this want of symmetry is due to the original want of symmetry of the dome, which was continued eastward as an anticlinal fold running past Shap Fells.

IV.—Establishment of Fault Valleys.

Though the directions of the main streams are not due to the geological structure of the rocks over which they now run, those of some of their major tributaries are undoubtedly so due. In some cases simple faults have acted as planes of weakness, along which the streams have worn valleys; but the most interesting examples of tributary valleys along fault-lines are not formed along single fractures, but along a complex of faults, and as I have not been able to find any description of valleys of this character, I wish to call special attention to them. The best illustration of the type is the Vale of Troutbeck, which joins the Windermere valley a little north of Bowness. It has long been known that the beds are displaced by faulting along the line of this valley; but detailed mapping of thin bands of strata shows that the disturbance is not a simple fracture, but a series of faults of varying size, causing the division of the beds into a series of large blocks. In the accompanying section of an easily recognized band, the Coniston Limestone is shown crossing the Troutbeck valley. Five faults are represented, but the largest and most easterly one is not necessarily a simple fracture as here indicated, for the bottom of the valley is extensively occupied by superficial accumulations, so that detailed

* In connection with this, it may be noted that the age of the intrusive rocks of Carrock Fell has never been determined, and that they strikingly resemble certain igneous rocks of Tertiary age in Scotland.

mapping is there impossible. Only the large faults are represented; there are many smaller ones which cannot be represented on the scale of the map. On either side of the valley the limestone runs with greater regularity to Windermere on the one hand, and over the ridge into Kentmere on the other. The bottom of the Kentmere valley is also occupied by numerous faults of a nature similar to those of Troutbeck, and the same is probably the case in the parallel valley of Long Sleddale, though the bottom of that valley is so largely occupied by drift deposits, that little can be seen.

A peculiar set of movements, the cause of which it is not our province to discuss here, has produced a number of belts of broken rock, running in a general north and south direction in the district east of

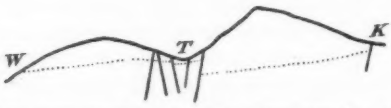


DIAGRAM-SECTION FROM WINDERMERE (W.) ACROSS TROUTBECK (T.) TO KENTMERE (K.), SHOWING FAULTS IN CONISTON LIMESTONE.

.... CONISTON LIMESTONE. /\ FAULTS.

Windermere, and constituting what geologists term a fault-breccia on a very large scale. Along these belts denudation has operated, causing the prominent north and south valleys, such as Troutbeck, Kentmere, and probably Long Sleddale, while the intervening belts of unbroken rock have resisted denudation, and consequently stand up as ridges separating these valleys. Detection of fault-complexes of the character described above is difficult, except under the conditions occurring in Troutbeck and Kentmere, where several easily identified beds of different character and of no great thickness cross the valley. Amongst the very puzzling volcanic rocks which constitute the most picturesque part of the district, the occurrence of these shattered belts is not so easily recognized; but, as the result of many years of observation, I am led to believe that many of the minor valleys of the volcanic tract (occupied by what geologists term the Borrowdale Series) have been formed along belts of broken rock, and not along simple fractures. The cleft of Dummail Raise and the valleys of Thirlmere and Grasmere which run north and south from that cleft are apparently due to a belt of shattered rock of the character described above.*

* A somewhat similar rock-structure occurs in, and is largely responsible for the origin of, the Christiania fjord, though in that case softer rocks have been let down amongst harder ones (see W. C. Brögger, "Ueber die Bildungsgeschichte des Kristianiafjords," *Nyt Magazin for Naturvidenskaberne*, 30ste Bd (1888), p. 99).

V.—Strike-Valleys.

Valleys formed by denudation along softer rocks intercalated between harder strata occur as tributaries to the main valleys, and also to the larger tributaries described above, and may therefore be noticed next in order. The best marked strike-valleys are those formed along the soft graptolite-bearing "Skelgill beds," which are intercalated between the harder Coniston limestone series below and "Browgill beds" above. Passing from east to west, we find a small depression running all along the outcrop of these beds from Shap to Millom, and as the strike of the beds is east-north-east to west-south-west between Shap and Coniston, and north-east and south-west between Coniston and Millom, the streams also flow in those directions. Wastdale Beck flows towards the east-north-east to Shap Wells, where it joins the Birkbeck; Browgill flows to the west-south-west to join Stockdale, a tributary of Long Sleddale; Skelgill (= Holbeck Gill) flows from the heights above Low Wood to join Windermere near the Low Wood Hotel; Pull Beck flows east-north-east to the west shore of Windermere; Mealy Gill, having a north-east course, joins Church Beck, Coniston; and the most important of all the strike-streams flowing along the Skelgill Beds, Appletreeworth Beck, rises on the moorland west of Coniston, and flows in a south-west direction past Broughton Mills.

A strike-valley of considerable importance occurs between Scales and Keswick, and is occupied by the lower waters of the Glenderamackin and by the Greta. The streams run along soft shales of the Skiddaw slate series lying between the hard Skiddaw beds to the north and the harder rocks of the Borrowdale Series to the south.

Closely related to these strike-valleys are the valleys which occur between the Lower Palæozoic rocks and the Carboniferous rocks, and indeed they are parallel to the strike of the latter. Several important valleys occur in this position; I may mention the Lowther, north of Shap, and especially the head-waters of the Lune, north of the Howgill Fells. I have already stated that, physically, the Lune rises on Shap Fells. Its actual source is now about Ravenstonedale, and there is little doubt that this portion, once an insignificant tributary of the original river (which it joins at Tebay), has gradually worked its way backwards along the line of junction of Lower Palæozoic and Carboniferous deposits until it has reached its present position.

I have treated of the strike-valleys as formed after the fault-valleys of Troutbeck, Kentmere, etc., because some of them, as above seen, are tributary to those valleys; but other strike-valleys may have been initiated simultaneously with them, or even before them.

VI.—Changes produced during the Glacial Period.

That the most important valleys described hitherto were formed before the Glacial Period is shown by the existence of glacial relics

within them. We have now to consider the changes produced during this period. Many of the changes recorded above have resulted in the production of tributaries of the radial drainage-lines, which have not disturbed the symmetry of the drainage; but the changes about to be considered have produced marked complications, though, as they are on a small scale when compared with the river-systems as a whole, the general symmetry of the drainage-lines still remains obvious.

The deviations of stream-courses produced in Glacial times were due to the blocking of valleys by drift * (or, rarely, by ice) to a height

HAWESWATER FROM MEASAND. A TYPICAL VALLEY-LAKE.
(*E. J. Garwood, photo.*)

above that of a point on the watershed which separated the blocked-up valley from an adjoining one. In such cases the waters were ponded up in the valley until they reached the height of the col, forming a pond or lake, the permanence of which depended largely on its size. In two recent papers read before the Geological Society,† I explained the existence of a large number of the tarns of Lakeland as due to this cause; and in a communication read before the Geologists' Association,‡ I have endeavoured to show that the larger lakes of Lakeland were produced in the same way, and were not formed by erosion of rock-basins by ice. The latter conclusion is largely based upon the very

* I use the term "drift" vaguely to signify the detrital material which was deposited by the agency of ice during the Glacial Period.

† *Quar. Jour. Geol. Soc.*, vol. li. p. 35, and vol. lii. p. 12.

‡ In January, 1896; not yet published.

valuable series of facts recorded by Dr. H. R. Mill, which appear to me to be absolutely inexplicable on the ice-erosion hypothesis; and we are driven to conclude that the lakes were formed either by stoppage of valleys by drift, or by differential movement of the Earth's crust, causing the formation of barriers across the valleys. In the paper cited, I have given reasons for rejecting the latter explanation and adopting the former.

The map appended to the paper shows the principal changes which occurred in the drainage in glacial times, some of which I have described elsewhere. It will be convenient to begin at the north-east margin of the district, and to notice the various cases of deviation of drainage-lines as one travels round.

I have elsewhere * given reasons for believing that Mosedale,† west of Shap Wells, once drained into Wet Sleddale, and by the formation of a drift-barrier was diverted into Swindale. Proceeding to the north, the Eamont, coming from Ullswater, flows over drift to near its junction with the Eden, when the old drift-filled valley runs somewhat north of the Eamont past Edenhall. Ullswater appears to have resulted from this drift-dam, but the drainage of the higher part of the Eamont is still along the old course, though the lower course of the Eamont, or of the Eden below its junction, has probably been altered to a considerable extent. The next diversion of drainage is in the valley, already alluded to more than once, lying between Saddleback and Carrock Fell to the west, and the high ground around Greystoke to the east. It will be remembered that I suggested that at one time a stream ran from the neighbourhood of Mell Fell northwards to Carlisle, occupying the present valley of the Caldew along the lower part of its course. The first change in the direction of the drainage of this tract was stated to be due possibly to the uplift of the Skiddaw-Saddleback group, causing the formation of a watershed east of Carrock Fell, and allowing the water to flow southwards from thence, through the Glenderamackin valley towards Keswick. At a later period Swinescales Beck, flowing into the Eamont, may have captured the upper waters of Troutbeck, or Troutbeck may have originally flowed into the Eamont. In Glacial times, as I have elsewhere argued,‡ a drift-dam separated the Troutbeck stream from Swinescales Beck and diverted it into the Glenderamackin, whilst another dam of drift near the hamlet of Mungrisdale caused the beheading of the Glenderamackin, and turned its former upper waters into the Caldew drainage.

Two important valleys, the vale of St. John and the Naddle valley,

* *Geological Magazine*, Decade IV. vol. i. p. 539.

† The district abounds in valleys having this name. It appears to be a corruption of Mossdale, and therefore is specially applicable to many drift-filled valleys in which changes of the nature which I am describing have occurred.

‡ *Geological Magazine*, Decade IV. vol. ii. p. 299.

come from the south, and open into the Greta valley east of Keswick. The former vale receives the waters from Thirlmere, and I have given reasons for supposing that the drainage of the Thirlmere valley formerly flowed through that of the Naddle, and that, by the blocking of this valley by drift, the waters were diverted into the vale of St. John, and Thirlmere formed.

Passing into the main valley in which Derwentwater and Bassenthwaite are situated, we have an example of a minor deviation of a stream-course in Borrowdale. I have given reasons for supposing that the Watendlath valley once turned sharply to the west to join Borrowdale near Rosthwaite,* and that when the gorge was blocked by drift, the drainage was diverted into another small valley, through which it now flows to Lowdore.

What occurred at Watendlath on a small scale seems to have taken place on a much larger one at the foot of Bassenthwaite; the main drainage of the Derwent probably ran through the important Embleton valley at one time, and when this became blocked by drift, the drainage was diverted, and flowed over a low col at the present foot of Bassenthwaite, giving rise to the lakes of Bassenthwaite and Derwentwater, or rather to the lake from which these have been formed. Before leaving Borrowdale, mention must be made of some of the minor diversions caused by the formation of drift-dams. Some of these, as Sty Head Tarn and the Langstrath alluvial plain, have been mentioned in my paper on the "Tarns of Lakeland." The term "drift-dam" should hardly be applied to the former, as the obstruction is in reality a dry delta, as described in my former paper, and the tarn may be quite modern, for the dry delta was probably produced by a "cloud-burst" of the same nature as those noticed later. The Langstrath alluvial flat deserves more notice than that which it received in my former paper, where I stated that "a deep narrow gorge through rock at the lower end (of the alluvial flat) has drained the old lake, which was probably ponded up by the mass of moraine material lying west of the gorge and blocking the valley." As a matter of fact, the course of the old stream can be seen below the above-mentioned mass of moraine material. The gorge itself, which is post-Glacial, is of some length, and very deep as compared with its width, and, owing to the accumulation of stones at its lower end, the water in it is particularly deep. Every one walking up the Langstrath valley should turn aside 50 yards from the path, shortly after passing a huge detached block of rock just above the path.

I also noticed a mass of drift at the foot of the Rosthwaite alluvial plain, which "probably once extended across the Borrowdale valley and caused a lake, which was drained by the stream cutting through the drift." I have further to mention two other drift-ridges, each of which

* *Quar. Jour. Geol. Soc.*, vol. lii.

STY HEAD TARN, LOOKING TOWARDS THE OUTLET. A TARN FORMED BY DIVERSION OF A STREAM OWING TO A DELTA. THE ORIGINAL STREAM RAN BELOW THE SITE OF THE DISTANT DELTA TO THE LEFT OF THE PRESENT EXIT. THE DELTA IN THE FOREGROUND, AND THE COMPLEX ONE ON THE LEFT HAND, ARE NOW FILLING UP THE LAKE.

(E. J. Garwood, photo.)

once formed a lake now marked by an alluvial flat. The larger starts at the end of the ridge separating the Stonethwaite and Comb Gill valleys, and, curving round to Rosthwaite village (where it is plastered against the roches moutonnées which rise up in the village), is cut through by the stream which passes the hotels. The smaller crosses the Seathwaite valley just above Seatoller, and once caused a tarn between the hamlets of Seatoller and Seathwaite.

ALLUVIAL FLAT IN STONETHWAITE, WITH GORGE IN FOREGROUND. THE ORIGINAL STREAM, NOW DRIFT-DAMMED, RAN CONSIDERABLY TO THE RIGHT OF THE PICTURE.
(*E. J. Garwood, photo.*)

The next valley-system contains Buttermere, Crummock, and Loweswater. The origin of Crummock and Buttermere appears to have been similar to that of Bassenthwaite and Derwentwater, though in the case of Crummock the old drift-filled valley probably lies on the east side of Crummock, whereas that of Bassenthwaite is situated on the west side of that lake.

Loweswater is particularly interesting. As Dr. Mill remarks, the valley containing it is one of two important valleys in which the streams flow towards the heart of the district, the other being that of Glenderamackin. The direction of flow of the stream from Loweswater, however, appears to be due to the blocking of the former valley, which occupied the sites of Mosedale (south of Loweswater), Loweswater itself, and the Marron river, by drift at Waterend, near the head of Loweswater, thus forming the lake, and reversing the direction of the drainage south of the barrier.

Ennerdale lake is also apparently due to a drift-filled valley, the

waters of which probably ran west towards Whitehaven or St. Bees. When the drift-dam was formed, the Ehen was diverted southwards to Sellafield, and the Ennerdale lake came into existence.

The drainage of the Bleng and Irt is also very interesting. The Bleng flows south-west to Gosforth, then turns almost to the north-east towards Strands, below which it is joined by the Irt flowing from Wastwater, and the combined streams flow south-west from Santon bridge to Drigg. At one time the Bleng probably flowed from Gosforth to Seascale, and was joined by the Irt. A drift-barrier below Gosforth diverted its waters along the lower part of what was then the Irt, but in an opposite direction to that in which the Irt was flowing. In the mean time another drift-dam, west of the lower part of what is now Wastwater lake, formed the lake, and caused its waters to flow for some distance to the south-east of the original course of the Irt, until they united with the diverted stream of the Bleng and flowed together from Santon bridge, along what was once a valley occupied by a minor stream.

Two interesting cases of diversion occur near Eskdale, both of which are described in my paper on the "Tarns of Lakeland." The stream from the upper part of Miterdale has been diverted into Eskdale, causing the formation of Burnmoor tarn; and the upper part of the Black Beck, occupying the valley in which Waberthwaite is situated, has also been diverted into Eskdale, with the formation of Devoke Water. This case is of interest as forming, perhaps, the best link between the tarn and the valley-lake. The following show a gradual passage from the tarn at one extreme to the valley-lake at the other: Easedale Tarn, Hayeswater, Burnmoor Tarn, Devoke Water, Rydal, Grasmere, Thirlmere.

The last and perhaps the most striking case of diversion to be noticed occurs at the foot of Windermere. The Windermere valley is continued in the same line by the important Cartmel valley, now occupied by an insignificant stream, whilst the present drainage of Windermere through the narrow Leven gorge looks most unnatural. The col between Windermere and the Cartmel valley and the bottom of the Cartmel valley are covered by drift; and it seems evident, when one is on the spot, that the Windermere drainage once ran down past Cartmel, and when this valley was blocked by drift, the drainage was diverted into the Leven gorge, and the lake formed.*

Other minor cases of divergence of stream-lines will, no doubt, be detected, but I have given enough examples to show that very considerable modifications of the drainage-lines of the district have been produced owing to the formation of drift-dams. Such dams have probably played a most important part in modifying drainage of other

* In the paper read before the Geologists' Association, an example of a valley in Furness, filled with drift to many hundred feet below sea-level, is cited. There is, therefore, no difficulty in accounting for lakes like Windermere, the lower parts of which are below sea-level, by supposing that they are drift-dammed.

areas. Professor W. M. Davis, for instance, remarks of the Yorkshire Derwent, "The peculiar position of the head of the subsequent Derwent, close to the sea, suggests some glacial interference with normal adjustments, and calls for special explanation." *

VII.—Formation of Post-Glacial Gorges.

In the region around Scawfell, where the rocks are hard and well jointed, we find every gradation, from the "rake" or "couloir" running down the side of the hills to the larger tributary valleys, and it is easily seen that the rakes, and most of the smaller valleys, owe their position to the occurrence of planes of weakness, which are either "master-joints," faults (often filled with breccia), or dykes of igneous rocks, which weather more rapidly than the rocks into which they are intruded. Clifton Ward long ago pointed out that the chasm of Mickledore is due to a dyke, and it is only one of many scarring the sides of the Scawfell group.

The Peers' Gill ravine is a particularly good example of a gorge formed along a line of weakness, or rather two sets of such lines crossing each other at right angles. When viewed from the top of the Sty Head pass, it is seen to have a Z-like course (the limbs of the Z being at right angles to the main line); and a number of tributaries which enter it also cut along the set of planes of weakness, which run at right angles to the most prominent part of the gill, namely, that descending Lingmell, and exactly facing the top of the Sty Head pass. Some of these rakes and minor valleys were no doubt initiated in pre-Glacial times, but we have evidence that others are much more recent. Strahan † notes that "a great mass of *débris* was washed down from the sides of Blease Fell, on the east of Lune, about 2 miles south of Tebay junction, in the course of three or four hours during a thunderstorm, about the year 1858. The rain excavated deep channels in the weathered rock of the hillside, and spread the rubbish over some pasture-land below. The *débris* still forms a striking object as seen from the train." The depth of parts of these channels approaches 20 feet. Similar effects must frequently have been produced as the results of such "cloud-bursts." Gilpin ‡ describes the occurrence of a cloud-burst on Grasmer (Grasmoor) on September 9, 1760, which brought down a vast amount of material. It was computed that the stream must have been 5 or 6 yards deep and nearly 100 broad. This same writer describes a similar occurrence in the Vale of St. John on August 22, 1749, "which

* *Geographical Journal*, vol. v. (1895), p. 143.

† *Mem. Geol. Survey*, "The Geology of the Country around Kendal," etc., p. 51.

‡ Gilpin, 'Observations on the Mountains and Lakes of Cumberland and Westmoreland,' vol. ii. pp. 4, 36. See also West, 'Guide to the Lakes,' 10th edit., p. 138, *footnote*.

forced a new channel through a solid rock, . . . and made a chasm at least 10 feet wide."

An interesting gully is seen somewhat north of the top of High Street, where, as seen on the 6-inch Ordnance map, the Roman Road is partially destroyed by a ravine which has cut through it. The head of the ravine is a few yards above the road, and where it cuts the road it is about 18 feet deep and 103 feet across at the top. It is excavated partly in loose rubble, but largely through rock *in situ*, though much affected by weathering. Some of the material may have been removed by landslip, but the greater part was probably disintegrated by running water, which has also removed it. Thus—

> "The massy ways, carried along these heights
> By Roman perseverance, are destroyed,"

and indications furnished of the amount of denudation which takes place under present conditions during periods of exceptional rainfall.

In a paper published in 'Natural Science,' * I called attention to the admirable examples of stream-erosion curves seen amongst the hills of Lakeland. They are seen to perfection when the bare rock extends to the summit of the hills. In other cases the curve is not steepest at the summit of the hill, but becomes gradually gentler at a varying distance from the top. In all of these cases the change in the character of the curve occurs, so far as I have observed, when bare rock is replaced by peaty covering, which frequently masks the rocks on many of the high hills (as in the case of all the Howgill Fells, also on the Thirlmere side of Helvellyn, on High Street, and indeed on the greater number of the fells). The shape of these peat-covered upper portions seems to be due to weathering unaccompanied by stream-transport and stream corrasion, and accordingly we get the characteristic spheroidal (in this case hemi-spheroidal) outline on a large scale (frequently seen on a small scale in granite tors), which is largely due to the greater action of the weather along well-marked divisional planes than elsewhere, causing the gradual conversion of a cubic into a spheroidal body.†

I have indicated what I believe to be the principal points in the history of the Lake District drainage. The minor changes are more readily ascertainable here than in other places, owing to the extreme simplicity and regularity of the initial drainage-lines. Insignificant as many of these changes are, it may be useful to notice them, as attention may thereby be called to changes of more importance and on a larger scale elsewhere; and, furthermore, I believe that their record will enhance the pleasure of the increasing number of people who journey to Lakeland with a desire to know the meaning of the physical features of that lovely district.

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* *Natural Science*, 1895, p. 240.

† See also F. Rutley, "On the Dwindling and Disappearance of Limestones," *Quar. Jour. Geo. Soc.* vol. xlix. p. 372, pl. xviii.

Before the reading of the paper, the PRESIDENT said: We had last year evidence given us of the great interest and instruction we may derive from the study of English geography, when we listened to the paper communicated to us by Dr. Mill on the English lakes. We now have with us Mr. Marr, secretary of the Geological Society, and I am sure his account of the drainage of Lakeland will be equally interesting. I now call on Mr. Marr to address the meeting.

After the reading of the paper, the following discussion took place:—

Mr. W. T. BLANFORD: I can only say I have listened with very great attention and pleasure, as I am sure everybody else has, to the description Mr. Marr has given of this interesting country. There is no subject more worthy the attention of a geographical society than the origin of hills and valleys, and these are exceedingly well marked in a tract of country of this kind. The history of river valleys is one of the questions of modern geology, a question which has arisen within my recollection, and which was almost ignored by many of the great geologists fifty years ago. When it was first pointed out by certain geologists, amongst them Jukes, that river valleys are of great antiquity, the idea was looked upon as almost heretical. Rivers are of very ancient origin; in many cases they are older than the mountains they traverse. All sorts of explanations have been adopted for the fact that a great many rivers run across mountains from side to side, and there is no doubt that all sorts of explanations may be necessary, because the fact is an extraordinary one. A very simple explanation, but a most obvious one when fully conceived, is the simple fact that the river existed before the mountains, and, as elevation gradually took place, the river kept its way, cutting through the mountains. Two of the most extraordinary cases known are those of the Indus and Brahmaputra, cutting through the Himalayas, and actually running from one side to the other of the biggest mountains in the world, and that this is so is probably due to the fact that the rivers were there before the mountains existed. When one once gets this idea of the enormous power of a river, its history becomes a question of great geographical importance. I think that, as a contribution to the history of rivers, Mr. Marr's paper is of particular interest, because he shows not only how the rivers make their valleys, but also how rivers change their courses, how a river forms itself into a lake and runs out again at the other end; and he describes the evidence of other changes that have taken place in the country, some of the most important being those due to the glacial period, to which geologists and geographers look back as an explanation of extraordinary phenomena, some of the deductions being rather extravagant. After the care Mr. Marr has brought to bear upon the examination of the distribution of streams and valleys in Lake-land, there is no doubt that the result has been of much importance, and I can only say, with regard to the interest of Mr. Marr's researches, that in one or two cases where I once thought that lake-basins were produced by distinct glacial erosions, he has found the features to be due to other causes. I believe there is no point of geographical interest of more importance than the careful examination of the features of a district in order to trace out the causes of their origin and formation.

Dr. H. WOODWARD: I came here to listen and learn, and I have been greatly interested in Mr. Marr's paper. I think we have heard something of the views Mr. Marr has given us to-night before, with regard to the formation of the small lakelets in lakeland. I must say that his application of Gilbert's view, with regard to the elevation of the central mass of the Lake District, is one which must strike geographers as of very great interest, showing that the features of the country have not been made by ice, but by those great physical alterations in the level and geographical and geological structure of the country which have been impressed upon the land at an earlier time. One of the things that strikes one

most is the way in which rivers have continued to hold certain directions through great changes in the denudation of the country; and one would almost compare this change in the Lake District to a very interesting experiment which was shown by Professors Ayrton and Perry some years ago at the Royal Society with regard to the magic mirrors of Japan, which have been impressed on the back with a series of ornamental patterns, while the front has been polished for the ladies of Japan to admire their faces. When held at a certain angle with the beams of the sun, the workmanship at the back can be reflected from the face of the mirror upon a screen. Now, these great changes effected in the removal of the surface layers from the Lake District seem to have been unable, after all, to force the rivers entirely out of their original courses; for, although great masses have been removed, the rivers have held on their original courses, save where at later times glacial drifts have blocked these river-courses, and in some cases deflected them from their original channels. I cannot help thinking that we have learned from Mr. Marr a most useful geological lesson, which a great many Fellows of this Society must have enjoyed as much as I have.

Mr. Aubrey Strahan: I have listened with very great interest to this paper by Mr. Marr. Mr. Marr has not only an intimate knowledge of the district, but I am glad to see he has also an equally intimate knowledge of the literature connected with it. It is not everybody who reads the official publications of the Geological Survey, or makes much use of them, and it is satisfactory to find that somebody gains something by them of any use. This is undoubtedly a very fine district; but, unfortunately for a number of questions, the evidence is rather meagre. We know perfectly well that the country was buried and dug out again by denudation time after time; but the denudations have been so complete, that some of the later formations have been clean swept away, and have left no trace to show how far they extended over the district. I don't know that Mr. Marr himself is able to produce any evidence that the Oolites and the Cretaceous rocks extended over the district; yet our knowledge of the initiation of the river system rather depends on our knowing what formations covered these mountains. The Dent fault, to which he alluded, is an extraordinary example of the denudation being kept up with by the river. A fault of that description, if it came into existence suddenly, would produce a vertical cliff of something between 1500 and 2000 feet high, a crack going down we know not how far. Notwithstanding this, there is not a sign of its presence on the surface of the ground, except a feature due to a hard rock on one side, and a soft on the other. There are plenty of such faults through the country, many of greater size. The upthrow of the fault is absolutely unrepresented by any change of level in the ground, except that due to the hardness of the rock. Now, of these rivers, one coming down Garsdale flows from the lower side of the fault, and right across it on to the ground uplifted. There seems an explanation of this, and that is the one Mr. Marr gave. The fault came into existence after the river had established its course, and a general denudation of the ground kept the surface level in spite of the fracture. Mr. Marr attributes a very late date, later than most others have attributed, to the drainage system, and in this I am disposed to agree with him entirely. It is no new thing that enormous denudation has taken place in what we geologists speak of as a comparatively recent period, the post-Tertiary or Tertiary. As examples, take the rivers Thames and Frome; their valleys we know are post-Tertiary. Between the rivers is a structural arch, from the crest of which run the tributaries to the main streams. It is true that the arch between them is only partially perfect. In Salisbury Plain and round Basingstoke it still retains its crest, but further east there are only the foundations from which the walls sprang, namely, the North and South

Downs. The crest of the arch itself lay in what is now the valley of the Weald; but the rivers have kept their old courses, and, flowing north and south straight at the ramparts of chalk, penetrate these, and get through to the sea. Still further south there is another water-parting of exactly the same character; but there exist only the headwaters of the streams that flowed from that parting. The sea has swept the whole of that further river-basin away. There are other examples in some of the hill districts in North Wales, the Lake District, and Scotland, to which I would call Mr. Marr's attention—abandoned valleys which seem to have no meaning in them, which carry no water, and serve no purpose. I suggest that it is possible that they represent the remnants of a very ancient drainage system, which has been abolished and replaced by a more recent system, such as that which Mr. Marr has described. In conclusion, I wish to express my gratification at having had the opportunity of hearing this excellent paper.

Dr. H. R. Mill: When, a short time ago, Professor Milne spoke of the hills nodding their heads to one another, and showed us the Earth's crust in a state of continual tremor, it may be that some of those who hold that this Society is concerned mainly with the exploration of foreign lands, thought that a practical joke had been played upon them. To-night it must have struck some, when Mr. Marr described rivers wandering over the country, and valleys working backwards to behead and capture the water of other rivers, that the land is in a very much less stable condition than they had been in the habit of thinking. The surveyor measures the land as he finds it at the moment of survey, and the cartographer maps it, but when a geographer begins to describe the physical features of the land surface, he finds it absolutely necessary to give a reason for the arrangement of these features; and Mr. Marr has shown, for the first time at an evening meeting of this Society, how these features came into existence, according to certain well-defined and perfectly ascertainable laws. In America Professor W. Morris Davis, and in France Professor de Lapparent, have elaborated a method of studying these phenomena of dynamic geography, as we might call it, and I am pleased to see that Mr. Marr, while acting independently in the same direction as these gentlemen, has, for purposes of popular description, avoided their terminology. In its proper place, the theoretical elucidation of practical problems, a precise terminology is essential, and in introducing one for such purposes Professor Davis has rendered an inestimable service. I am personally gratified that Mr. Marr found the work which the generosity of this Society and the help of Mr. Heawood enabled me to do, of service to him; and we must all congratulate ourselves that in our own country there still remain districts which can be studied with results so interesting and novel. I have lately revived an old idea that a geographical memoir of the whole country ought to be compiled. I was interested to hear Mr. Strahan say that the geological memoirs had grown. I wish I knew the particular agricultural operations necessary to ensure such growth, for I would like to apply the same principles of culture to a memoir of the Ordnance Survey, which should enable us to further the study of the influence these various land-forms had upon the different conditions of the district, on the plant life, the animal life, and the life and movements of man himself. That is the real end of geography, to elucidate the relation of man to the Earth. Dr. Haviland has gone into many of the conditions of human life brought about by these very river systems, mountains, hills, and watersheds of the region of which Mr. Marr has been speaking. We are extremely indebted to Mr. Marr, an accomplished geologist who has thrown so much light on the foundations of physical geography.

Mr. H. J. Mackinder: I came here, like Dr. Woodward, entirely as a listener to what I knew would be an interesting paper from Mr. Marr. There is one point

which struck me in what Dr. Mill said just now by way of commendation of Mr Marr, that he had avoided the use of the terms with which Professor Davis had equipped this branch of the subject. I agree with him, that this evening it was probably right to avoid the use of these terms, but I trust that no one will carry away the idea that they are therefore without use. Mr. Davis has done a very valuable thing indeed in giving us terms which, with all due deference to Dr. Mill, I cannot regard by any means as so uncouth as those with which most sciences are equipped. "Subsequent," "consequent," and so forth, enable us at once to compare the rivers or parts of rivers we have studied in any particular district with other rivers. During the whole evening, I could not help feeling how admirably the intellectual analysis implied in Mr. Davis's terminology fitted with every sentence by Mr. Marr. One other suggestion I would venture with great diffidence to put forth. Might there not have been, between the rising of the dome and the origin of the drainage, a period which the Americans would describe as of a "peneplain?" That, I think, would be in harmony with the view expressed by a speaker just now, and would explain why the centre of drainage does not coincide with the centre of structure.

Mr. MARR: Most of the words I have listened to have given me very great pleasure, and I thank you for the reception accorded to my paper. I am glad to hear Mr. Mackinder take up the cudgels in favour of Professor Davis's terminology, though it is somewhat technical, but had I used it, instead of hurrying over sentences which my hearers found it difficult to follow, I should have been able to replace sentences with words pregnant with meaning. I have already considered the possibility of the existence of a peneplain, but I am bound to say that I cannot explain the drainage by the existence of such a peneplain. That and what Mr. Strahan has said about the rocks which once extended over the district, are matters which are largely geological.

The PRESIDENT: I think I may congratulate Mr. Marr, and I am sure I may congratulate the meeting on his having been able to give us a most interesting address as an eminent geologist, which has been entirely geographical; for he has avoided strictly geological subjects, and has explained to us the actual changes which have taken place in a region well known to most of us, and the causes of these changes, which is physical geography; and in the discussion, what he has said has been illustrated by some of the speakers with reference to other parts not only of this country, but even of such distant countries as the basins of the Indus and the Brahmaputra. I am sure the meeting will desire me in their name to return very warm thanks to Mr. Marr for his most valuable communication this evening.

CRUISE OF THE "BALÆNA" AND THE "ACTIVE" IN THE ANTARCTIC SEAS, 1892-93.*

II. THE "ACTIVE."

By CHARLES W. DONALD, M.B.

LEAVING Dundee on September 8, 1892, we touched Madeira and the Falkland islands on our passage south.

We passed the first iceberg on December 18, at 4 a.m. It lay about 4 miles to the eastward, our position at the time being about lat. 61° 8′ S., long. 52° 7′ W. Clarence island, South Shetlands, was

* Continued from the May number. Map, p. 509.

sighted at the same time, bearing about W.S.W., and distant some 40 miles. It seemed to be almost wholly snow-covered. Soon after 9 a.m. we were steaming through water dotted here and there with large and small pieces of floating ice. These gradually increased in number as we advanced to the south. About 10 a.m. seven or eight bergs were in sight to the eastward; these were mostly flat-topped, in shape roughly rectangular. Their perpendicular walls rose 100 to 150 feet above the sea-level. Several measured over a mile in length. In some cases the cliffs showed little or no traces of water-wearing; others, again, had their whole faces scooped out to a height of 10 to 15 feet, with here and there low deep caverns showing. The colouring in these caverns was wonderful, every shade from a light green to a dark blue being seen as one looked deeper and deeper into them. During the afternoon we saw several penguins of the black-throated variety—*Dasyrhamphus adeliæ* (H. & T.)—either standing or lying on pieces of floating ice. Several whales of the finner tribe were seen, and one chionis. Light pack or stream ice was met with in lat. 62° 4′ S., long. 52° 13′ W. Shortly before 7 p.m. we were steaming along the east side of this. Several white petrel, seals, and penguins were seen about the stream. The day was somewhat foggy, though clear at intervals; occasionally rain fell. The wind during the morning and forenoon was N.E. and light, changing in the afternoon and evening to a moderate or fresh westerly breeze. Position at noon, 61° 38′ S., 52° 10′ W.

The morning of December 19 was foggy up to 11 a.m. Between 10 a.m. and 9 p.m. we were under steam, making a southerly and somewhat westerly course, the direction of the ship's head being frequently altered to avoid ice-streams or in order to cross them at their narrowest part. The ship was occasionally stopped to pick up a seal. The total distance run was about 36 miles. During the afternoon we passed numerous bergs, the large ones being for the most part to the eastward. Several finners, a bottlenose whale, several seals, and penguins were seen. The varied shades of blue colouring the snow on the floating ice were very striking. I remarked that by direct light the snow appeared white, while by transmitted light it was of a blue colour, varying in depth with the thickness of the stratum. At 9 p.m. we got beset in attempting to cross an ice-stream. The stream was composed of heavy pieces of cake or broken floe ice, with here and there small bergs. After four hours' work we got clear on the north side, the side on which we had entered. Snow fell from 10 p.m. up to 4 a.m. on the 20th. The barometer at 1 a.m. read 28·952 inches, being our first reading below 29 inches. Position at noon, 62° 10′ S., 52° 21′ W.

Thick fog forced us to lie to during the morning and afternoon of the 20th; the fog continuing, though not so dense, during the afternoon and evening. At 6.30 p.m. steam was started, and we navigated across the pack in which we had been beset on the previous evening. It was

from 1 to 1½ mile in breadth. Several large bergs were in sight during the evening; one in particular lying to the southward, and of which we only saw the western end, is, I believe, the same along which the s.s. *Diana* reports having steamed 20 miles. She gives the height as varying from 160 to 220 feet, the cliffs being perpendicular, and cut into at the base by numerous caves. Position at noon, 62° 45′ S., 52° 55′ W.

December 21 was marked by fog throughout. In consequence we made but little progress to the south. When the fog was not too thick, one or two boats were lowered to pick up seals near the ship. Prior to this date we had seen only the yellow seal, which corresponds to that mentioned by Ross as the crab-eater (*Lobodon carcinophaga*). The first of the sea-leopards (*Stenorhynchus leptonyx*) was got during the forenoon. Position at noon, 62° 54′ S., 53° 41′ W.

The wind during the 19th, 20th, and 21st, was northerly, with more or less of fog. During the 22nd the wind was more easterly, but the fog still continued. Sealing was carried out as on the previous days. Many of the skins got were very much scarred, one in particular having recent gashes extending through the skin and blubber into the muscle beneath. This was said to be the work of grampuses, or more probably the result of fighting amongst the seals themselves. Position at noon, 63° 9′ S., 53° 20′ W.

December 23 was gloomy, but the fog had cleared away before a light southerly wind. Soon after daylight the Danger islands were sighted. At 9 a.m. the largest bore W. by S., and was distant about 10 miles. Seven were counted in all, two of them being mere rocks, with little or no snow on them. The others were barren and partially snow-covered, black cliffs and solitary rocks standing out against the snow here and there. Steam was started at 7 a.m., and, with the exception of a few stoppages, kept up till 9 p.m., about 56 miles being made to the S.W. by S. The sea-water during this and the following day was of a dark brown colour. As seen against the tongues of ice, it was olive green. Tow-nets came up covered all over by small particles of brown vegetable matter having a fusty odour. Numerous bergs were seen in the neighbourhood of the Danger islands, all the larger ones being aground. These latter showed a distinct high-water line along the bases of their cliffs. At noon we passed within one-third of a mile of two large bergs, each grounded at one end only. The high-water line in these sloped down to meet the water at the end afloat. The upper part of both showed distinct horizontal striation. One had usual perpendicular fissures showing in its face, these, with one exception, opening at the top of the cliff. The latter was evidently of earlier formation. It did not reach within 30 feet of the top. I judged the height of these bergs to be about 150 feet. About 2 p.m. a small patch of land was seen looming out of the mist surrounding it. This bore about true west, and was, I imagine, part of Paulet island.

At 9 p.m, we steamed up to a small floe in lat. 63° 57′ S., long. 55° 20′ W., and then waited for the other ships to come up. On their arrival, the three ships steamed slowly along the floe in a south-westerly direction. Position at noon, 63° 32′ S., 54° 34′ W.

During the morning and forenoon of December 24 slight drizzling snow fell, with light southerly winds. The afternoon and evening were, with the exception of one snow-shower, marked by a very clear atmosphere and sunshine, the wind being not more than a light air from the south. During the forenoon, as the snow cleared away, the mountains of Palmer's Land were sighted to the west. The summit of Mount Haddington, rising to a height of 7050 feet, was distant about 50 or 60 miles. The somewhat flat land of Seymour island was visible some 15 to 20 miles to the west. Throughout the forenoon and afternoon the *Active*, *Balæna*, and *Diana* sealed in company, making at the same time fair progress to the south-west. At noon our position was 64° 14′ S., 55° 51′ W. At 6 p.m. we steamed up to an ice-floe which extended, as far as I could see from the deck, to the south. To this the three ships anchored. The position ascertained by observation on the following day at noon (supplied by Mr. Bruce) was lat. 64° 23′ S., long. 56° 14′ W.

The surface of the floe was very uneven, little hillocks and peaks of ice sticking up every now and then. The snow was loose and soft, allowing one to sink above the thighs at every few steps. Several fresh-water pools were seen in the hollows. Lying lazily behind the hummocks a few seals were seen. These did not appear to be frightened by our approach, and, when disturbed, made no attempt to reach the sea. A few large emperor penguins were seen on this and on the smaller floe passed on the previous evening. The view from the ship's deck was very impressive. To the west the dark mountains of Palmer's Land were thrown into various shades of light and dark by the now low sun. To the south the floe reached as far as the eye could see, with here and there large hummocks or small bergules thro wn into deep shadow against the dazzling whiteness of the general surface. Out to the eastward was a chain of bergs, their perpendicular faces tinged a bright red from reflection of the sun's rays; between these bergs and the floe was an open expanse of dark water. To the north lay the loose scattered ice, small bergs, and dark water-channels thro ugh which we had steamed. The absolute stillness and quiet, broken only occasionally by splash or harsh "quaugk" of a penguin or the soft "tweet" of the white petrel, made this a magnificent and imposing spectacle. Shortly before midnight I rowed past a berg on which was a quantity of land-earth.

Christmas Day was one of the finest we spent among the ice. It was nearly calm, with bright sunshine for the greater part of the day. The temperature of the air during the early part of the afternoon rose to 37° Fahr. The atmosphere was very clear. By daylight the spectacle

of last night seemed somewhat harsher in outline, but in the twilight, with the sea like a mirror, and slight ice forming on the surface, the effect was, if possible, enhanced, and acted on one like a spell. During the whole day large pieces of ice and small bergs were moving at a considerable rate along the floe edge, forcing the ships to change their position frequently. I also noticed, from hanging a line over the stern, that there was a current running from beneath the floe at a depth of about 10 feet. It ran with a speed of from 1 to 1½ knot in a direction slightly to the east of north. A sounding taken by the *Balæna* in this position gave a depth of 200 fathoms.

Early on the morning of December 26 we cast loose from the floe. Soon after 8 a.m. we got under sail. During this and the following three days we cruised to the N.N.E. under sail, in search of whales. A few seals were picked up each day. The wind during these four days was easterly or north-easterly. From light to moderate or fresh breezes. The temperature of the air was for the most part slightly below the freezing-point. The weather was clear, though overcast and somewhat gloomy.

At noon on December 29 we were in lat. 63° 48′ S., long. 55° 46′ W. On the 30th, at 9.30 a.m., our position was about 63° 44′ S., 55° 34′ W.; Paulet island bearing N.N.W. (true), distant about 8 miles. Light easterly and north-easterly winds prevailed. During the day we sealed among scattered ice, working in company with the *Diana* towards the north of Paulet island. During the evening we passed several grounded bergs, which had on their tops and sides stones and earth. A northerly current was flowing past them at a rate of 1 to 2 knots. At 11 p.m. Paulet island bore S.W. by S., distant about 4 miles. Its shores, as seen through the glass, seemed dotted with penguins and loose stones. A valley running down the northern side was strewn with boulders, and had a rich brown colour, which I supposed at the time to be due to some form of lichen or moss. A similar colour was, however, observed on a beach where I effected a landing, no vegetation being found that could have been seen from the ship. We sailed for 1 or 2 miles along the land to the westward of Paulet island, there being still open water as far as we could see to the W.N.W. After this we turned, and, in company with the *Diana*, steamed out to the eastward again. The weather was fine and clear.

December 31 was marked by light south-easterly winds and bright sunshine. One large berg was seen with a quantity of earth upon it. At times during the day we had as many as a hundred bergs in sight at one time. The *Diana* kept us company all day. Our position at noon was 63° 33′ S., 55° 10′ W.

On New Year's day, 1893, the wind was still light, but more northerly; the day clear, though with but little sunshine. At noon the other three ships were all in sight, our position being 63° 41′ S., 55° 12′ W.

At 5 p.m. a whale was seen close to the ship, lying on the surface of the water, in a manner said to be very similar to that of the Greenland whale. It had a short dorsal fin.

During January 2 light northerly and westerly winds or calms prevailed, with bright sunshine all day. Our position at 11 a.m. was about 63° 47′ S., 55° 37′ W.; Paulet island bearing N. by W., and distant about 10 miles. In the forenoon a small avalanche was seen on the land to the north of Paulet island. The sound caused by the breaking off and falling down of these or smaller masses of ice can, on a calm day, be heard for miles around. Mountain peaks were seen to the N. and to the S.W. During the day we worked southwards and westwards into Erebus and Terror gulf. In the evening we passed a small piece of ice with a quantity of land-earth on it. At midnight several small finners were playing about the ship.

During January 3 a cold north-easterly wind blew, and some snow fell. During the afternoon a rocky island was sighted. It does not seem to be named on the chart. At 4 p.m. this island bore some 3 to 4 miles to the S.W. It stands from 200 to 300 feet in height, and is probably about 1½ mile in circumference. There was but little snow on it. Upon the top a greenish-brown colour was observed, similar to that previously seen on Paulet island. One or two photographs of this island have turned out pretty well. During the evening two boats were lowered after a whale, which in its movements was said to resemble the Greenland whale. Several bergs and pieces of ice were observed with quantities of earth and stones on them.

On January 4 we cruised about the same ground. An easterly wind blew strongly during the morning, dying away during the afternoon and evening. The weather was somewhat misty; light snow fell occasionally. In the afternoon several large schools of penguins were seen, each school being controlled by a single individual of a larger species, which swam in the rear. Several bottlenose and finner whales were seen. During the evening there was a strong current or rather tide running west. The lead was thrown twice in about lat. 63° 28′ S., long. 56° 8′ W., and gave no bottom at 80 and 90 fathoms.

January 5 was the only day for which an absolute calm was reported for the whole twenty-four hours. During the forenoon we were sealing about the same ground as on the two previous days. At noon one of the boats fastened a whale. For the next thirteen hours the utmost endeavour was made to land him, but the task proved too much for us. The chase finished at 1 a.m. with the escape of the whale. It carried away with it half a dozen rockets, two harpoons, and some line. From a description of this whale which I showed to Prof. Thompson, of University College, Dundee, he recognizes it as a hunchback (*Megaptera longimana Antarctica*). We now (1 a.m.) lay 3 or 4 miles south of the western entrance of what Captain Robertson

afterwards named "Active Sound." This would make our position about 63° 21′ S. and 56° 39′ W. Another unnamed islet bore S. by W. about 6 or 7 miles.

On January 6 we pushed into the mouth of Active sound, our position at noon being lat. 63° 17′ S., long. 56° 35′ W., which would correspond with the western entrance of the sound. The wind was squally, and blowing strongly at times from the E. to N.E. To the east of us, as we lay almost land-locked, was a low flat beach about 1½ mile in length, and lying nearly north and south. There was but little snow on it, the surface appearing of a greenish-brown colour. To the north-east (by compass) the land was low, the ice-foot lining it being not more than 30 or 40 feet in height. The snow sloped upwards from this to a height of 150 feet or more, being intersected here and there by cracks and crevasses running parallel to the ice-foot. This ice-foot is broken, about a mile to the north and east of the beach, by a spur, which runs out towards the north-west, forming another similar but smaller beach. Over the innermost part of the spur, a small peak or corner shows black against the surrounding snow. To the north-west (by compass) the ice-foot was more irregular, reaching at its highest 60 feet or more. From this the snow sloped upwards much more rapidly than on the opposite side of the sound, the crevasses being wider and more numerous. At some distance inland a black peak showed through the snow, rising to a height of 300 feet or more. Nearly west (by compass) of us lay an irregular sloping face, dark brown in colour, and rising somewhat steeply to a height of about 100 feet. A spur of snow running down the centre divides it into two horns. This, seen through the glass, proved to be a large penguin rookery, the birds being seen in almost countless numbers. To the south (by compass), and some 10 miles distant, lay the unnamed rocky islet seen on the previous evening.

In the evening I landed on the beach which lay to the east of us in about lat. 63° 18′ S., long. 56° 35′ W. There was evidently a considerable rise and fall of the tide, which was about half flood, with still some 5 to 7 feet to rise. Along the tidal margin were quantities of dark grey or black sand, various seaweeds, a few shells, small blocks of red and grey granite, bits of sandstone, conglomerate, and black igneous blocks. Several vertebræ and other bones of a whale, all much decomposed, were found opposite our landing-place. Further inshore I picked up a piece of whalebone, said to be "finner bone."

Advancing inshore, I found the surface composed of small flattened angular stones. There was, for the most part, not a trace of lichen or moss about them. Here and there large black igneous blocks rose above the general surface. In the hollows were a few pools containing snow-water; near these I found a few small patches or rather tufts of moss. Near the centre of the beach, which was about a mile broad at

this point, I found the bleached skeletons of two young seals, with some of the long white fur still attached. Near the ice-foot, in the north-west corner of the beach, I came across a small penguin rookery, composed solely of the white-headed species (*Pygoscelis papua*). There were about forty nests in all, and most of the eggs were hatched. Several terns, saddle-back gulls, and a species of skua were seen near the rookery, but no penguins of a different species were seen within a mile of it.

From this beach I took as many specimens as possible. Numerous seals were got on the shore, almost all of them being of the small black-backed spotted variety, the *Omatophoca Rossii*, a species somewhat resembling the *Stenorhynchus leptonyx*. They were in very good condition. Large flocks of the great petrel were seen. During the evening a large finner whale was seen to jump like a salmon quite clear of the water. This occurred several times within 500 yards of the ship. A sounding was got within half a mile of the shore, which gave bottom at 40 fathoms. Soundings further out gave no bottom at 50 fathoms.

During the morning of January 7 slight snow fell. Shortly after noon the sun shone out brilliantly. At 1 p.m. it was quite calm, the sea like a mirror. To the south numerous finners were seen lying on the surface of the water, and sending their slender blasts high into the air. Lying in this position, I took from the west a series of photographs of the surrounding land, completing, as nearly as possible, the circle of the horizon. Shortly after 2 p.m. steam was started, and we proceeded in an easterly direction up Active sound. In breadth it averaged about 2 miles. The two shores were nearly parallel, running E. $\frac{1}{2}$ N. and W. $\frac{1}{2}$ S. (true). About 3 to 4 miles up the sound we passed, in the western shore, a conspicuous hill rising abruptly to a height of 500 to 600 feet. This, so far as I know, has not been named. I took a photograph of it bearing W., and also a sketch bearing S.S.W. Soundings taken as we came along gave no bottom at 40, 60, and 80 fathoms. The shores of the sound are lined by an ice-foot, averaging on the northern side about 60 feet in height, and somewhat lower on the southern side, with only here and there a rock or small beach showing beneath the ice-foot. On the southern side the snow sloped gently up from the top of the cliff, reaching not more than 100 to 150 feet. On the northern side the slope was much steeper, the land rising higher, with here and there corners of rock standing out black against the snow. Several small bergs, some of peculiar shape, were seen in the sound. At 10 p.m. fog came on, and the ship was made fast to a piece of ice close to the ship.

Early in the forenoon of January 8 we entered a bay opening off the north shore of the sound. To this the name of "Gibson Bay" has been given by Captain Robertson. The distance between the two points bounding the bay is about 2 miles, the greatest diameter of the bay about 3 miles. The shore is almost wholly bounded by an ice-foot from

60 to 70 feet high. There is little or no beach to be seen. At the head of the bay, to the N.W., lies a skerry 100 to 150 yards distant from the ice-foot. The eastern point—which has received from Captain Robertson the name of "Cape Alexander"—is formed by a steep hill or cliff, rising to a height of about 200 feet, with an inclination of 65° or 70°. The exposed rock is black, and seemed hard and crystalline. At the extreme point is a talus. The cliff facing the bay is crossed by two distinct narrow beds of a softer shale-like stone of a light brown colour, dipping towards the south at an angle of about 45°. Immediately underneath these interstratified beds were seen (with the glass) numerous flat angular stones of the same colour, seemingly indicating material of a softer nature and stratified arrangement. These I supposed might be beds of shale deposited on the top of volcanic matter. The general dark colour of the rock was relieved here and there by shades of orange, probably due to some oxide of iron. The opposite point of the bay is low and snow-covered. The bay itself was for the most part filled with loose pack-ice, on which numerous seals were lying.

On moving eastwards out of the bay at 5 p.m., it became evident that we had open water out towards the S.E. The north shore runs in a direction about S.E. $\frac{1}{2}$ E., while the southern shore runs about S.E. by E. The land lying to the south of us was therefore a separate island, completely severed from Joinville island by the channel in which we were then lying. The island was named by Captain Robertson "Dundee Island." Active sound extends, I believe, as far east as Gibson bay, while that portion of the channel to the east and south of Gibson bay has received the name of "Tay Firth." In summarizing these points, I must state that I think them far from accurate. I felt greatly the want of a chart on the spot, and many of the bearings I took are untrustworthy—whether through fault of mine or from the compasses being affected by the land, I am not sure. I feel very uncertain of the geography around the western entrance of the channel. The various names given by Captain Robertson I got from the *Scotsman* of June 10, 1893.

To the best of my knowledge, the channel which separates Dundee island from Joinville island is about 26 miles in length. In breadth it varies from 2 miles in its western portion to 5 miles in the eastern portion. The western portion, Active sound, runs E. $\frac{1}{2}$ N. and W. $\frac{1}{2}$ S. It is about 14 miles long. At its western entrance are two penguin rookeries; that on the north shore, a very large one—probably occupied by the common black-throated variety, the *Dasyrhamphus adeliæ;* that on the south shore—a small one of some forty or fifty nests—occupied by the white-headed variety, *Pygoscelis papua.* The positions of these two rookeries may be taken as: the former, 63° 15′ S., 56° 36′ W.; the latter, 63° 18′ S., 56° 35′ W. Some 7 or 8 miles up the sound, on the north shore, is the conspicuous hill already referred to. Its position is

about 63° 14′ S., 56° 20′ W. Both shores are lined by an ice-foot, that on the southern side being more regular and lower. In mid-channel casts of the lead gave no bottom at 40, 60, and 80 fathoms. The sound is terminated on the east by the western point of Gibson bay, opening off the north shore, and described above. This bay forms the head of the Tay firth. The position of its eastern point, Cape Alexander, may be taken as lat. 63° 15′ S., long. 56° 3′ W.

The general direction of "Tay firth" is S.E. ½ E. and N.W. ½ W. Its length, taking Cape Alexander as the western limit, is about 16 miles. In its western portion it measures about 5 miles across, narrowing down to about 4 miles as it advances east. The southern shore resembles that of Active sound. The northern shore presents at least one marked feature. This is a narrow bight, or geo, opening immediately to the east of Cape Alexander. It runs inland northwards for about a mile, curving to the west at its extremity, thus making a peninsula of Cape Alexander. It narrows rapidly from 600 to 800 yards across at its mouth, to 200 or 100 yards some distance inland. Its sides are lined by ice-cliffs some 200 feet or more in height. We penetrated a short distance into it a day or two later. On the eastern side of the entrance is a small penguin rookery. About 3 miles east of this, on the north shore, is a large penguin rookery, occupied by the common black-throated variety, the *Dasyrhamphus adeliæ*. A boat's crew effected a landing here on January 11, and obtained specimens of the eggs. The nests they describe as innumerable, and divided into blocks by paths placed at regular intervals, and intersecting each other nearly at right angles. On this north side the land slopes rapidly up from the ice-foot, leaving only the double peak of Mount Percy visible to us over the high ground in front. Our position at noon in Gibson bay was lat. 63° 14·5′ S., 56° 4′ W.

During the afternoon of January 9 we were sealing some 3 to 4 miles south-east of Gibson bay. Slight fog came down about 4 p.m., the wind having fallen from a moderate breeze to calm. Soon after 6 p.m. we lay to for the night.

On the 10th we had a short though somewhat sharp gale. The barometer had been slowly falling during the last two days, and reached 29·020 inches at 12.30 p.m. During the morning the wind rose from the south, and during the forenoon blew a gale. About 2 p.m. the wind was squally, blowing at times with a force of 9. Full steam was necessary to prevent the ship being driven to leeward.

At 2.30 p.m. we ran aground on a reef rising to within 1½ fathom of the surface at low tide. The reef is situated within a mile of the southern shore, and from our position on it Cape Alexander bore N. by E. ½ E. (true), distant 3½ to 4 miles. About half a mile inshore of us, and bearing S. by W. ½ W., was a skerry, rising some feet above the surface. The shore itself was lined by a low ice-foot. The position of this reef

—which may be called the Active reef—may be taken as lat. 63° 19′ S., long. 56° 7′ W. As the afternoon and evening drew on, the wind gradually died away. Vigorous attempts were made to get the ship off, but the falling tide at first rendered all our endeavours futile. The tide seemed at its lowest about 5 p.m., there being at that time 1½ fathom of water on the reef. The reef itself was composed of rough angular rocks, the surface being covered by seaweed and small stones. As the tide rose attempts were renewed. A line was run over the stern to a grounded berg some 80 to 100 yards off. A considerable strain on this, aided by the engines reversing at full speed, was at length successful, the ship gliding off at 9.15 p.m., to all appearance little the worse of the accident. We steamed out south-eastwards into open water, thus completing a circuit round Dundee island.

January 11 was warm and sunny. During the forenoon we were sealing to the south and east of the entrance to the Tay firth at about 10 hours. Paulet island bore W.N.W. and distant about 4 miles. About 1½ hour's steaming from 12·30 p.m. brought us to the ice on north shore of the Tay firth. The ice had collected here in considerable quantity as the result of the southerly wind yesterday, and a number of seals were found basking on it. Photographs were taken to illustrate the mountainous scenery to the west and north.

From our position in Tay firth at 7 p.m., Paulet island bore S. (true), distant about 12 miles. Lying just open of Paulet island to the eastward, and somewhat nearer us, was the rock or islet which I believe Sir James Ross calls Eden islet. Cape Alexander bore N.W. by N., distant about 8 miles, while the conspicuous hill on the north shore of Native sound lay to the westward just open of the north shore of Dundee island. Soon after 7 p.m. steam was started to the south. A northerly breeze springing up at 9 p.m., steam was stopped and the ship put under sail. Paulet island at this time bore west.

The position assigned by Sir James Ross to D'Urville's monument would place it on the western part of Dundee island. It is quite possible that it may be there, but I do not remember seeing it. It has occurred to me that Sir James Ross and D'Urville may both have seen the conspicuous hill referred to as situated on the north shore of Tay firth, and that Ross may have applied the name to this. I cannot say that I agree with Captain Robertson in thinking that the channel is capable of division into an eastern and western portion. I consider that it is one channel, and that no sufficient line of demarcation can be drawn between what he calls "Active sound" and "Tay firth."

The position of Dundee island is clearly defined as the southern portion of Joinville island. In shape it is long and narrow, its extreme length being 29 miles, and its average breadth about 4 miles. Its surface is flat and snow-covered, nowhere rising above 150 feet.

We continued under sail during the night of the 11th, and by 9 a.m. on January 12 had made about 40 miles to the south of Paulet island. Out to the westward of our position, and some 8 to 10 miles distant, lay Seymore island. It is somewhat flat and streaked with snow. Over the northern extremity of this we could make out from the deck what I believe to have been Cockburn island.

During the forenoon the other ships were sighted to the south and eastward. Steam was started about 1 p.m., and we ran down to the *Diana*, heading to the south of east. About 3 p.m. we passed an ice-floe, which I feel convinced was the same to which we were anchored on Christmas Day. This being so the floe had drifted about 12 miles to the N.N.E. between December 25 and January 12. During the afternoon several finners, grampuses, and bottlenoses were seen. The day, though overcast throughout, was fine, light northerly and south-easterly winds prevailing. Our position at noon was lat. 64° 13′ S., long. 56° 10′ W. During the night we remained hove to.

January 13 was spent sealing among loose pack ice. The weather was fine and calm. There was no land to be seen from the deck. The seals got were for the most part of the yellow variety (*Lobodon carcinophaga*), these being found in small "patches," six to eighteen seals on a piece. The spotted varieties, sea-leopards, are found singly, or at most in twos or rarely threes, on a piece. Numerous finners, grampuses, and bottlenoses were seen. During the afternoon we got a penguin with a black ring encircling the throat (*Pygosculis Antarctica*), this being the first of that species seen by us. Soon after 8 p.m. we lay to for the night, with the *Polar Star* in company. Between 9 and 10 p.m. we witnessed a very fine sunset. While sealing we made some 10 to 15 miles to the eastward. Our position at noon was lat. 64° 13′, long. 55° 46′ W.

The 14th was spent as the previous day. Light north-easterly winds with sunshine prevailed. During the forenoon we had some ten to twelve large bergs in sight. During the afternoon another variety of penguin was seen by the crew, and described as having a white spot on the crown of the head, orange bill and feet, and a black ring encircling the throat—that is to say, combining the characteristics of the *Pygosculis papua* with those of the *P. Antarctica*. This would go far to prove that the ring is not the distinctive mark of separate species, but merely indicates varieties of more common species. During the day we made about 12 to 14 miles to the E.N.E. Our position at noon was lat. 64° 11′ S., long. 55° 30′ W.

Throughout the night we remained hove to. At 9 a.m. on the 15th I shot a chionis, sitting on a piece of ice near the ship. Soon after 9 steam was started. We progressed slowly to N.E. by E., stopping here and there to pick up seals, probably making about 22 miles up to 4 p.m., when we were forced to lay to in fairly open water on account

of dense fog, which lasted all the evening. The forenoon had been bright and sunny. Our position at noon was lat. 64° 4′ S., long. 55° W. The fog continued during the following day, with light N. to N.N.E. winds. We did not shift ground to any extent.

January 17 was still somewhat misty, with moderate breezes from N. to N.N.W. Steam was started at 5.30 a.m., making about 40 miles to N.E. by N. At 8 p.m. sail was set, the course being altered to N.E. by E. for about 12 miles. We then wore ship to clear some pack-ice, and again stood to the north and east. Position at noon, lat. 63° 51′ S., long. 54° 16′ W. We continued under easy sail during the night, making a N.E. by E. course.

During the 18th we steamed at intervals in the same direction, stopping to pick up seals here and there. Our distance for the day was about 50 miles. During this and the previous two days, as we were making to the north and away from the land, the penguins gradually decreased in numbers. This was not to be accounted for by any change in the character of the ice. On our return south and westwards they gradually increased again. Our position at noon was lat. 63° 18′ S., long. 52° 45′ W. During this and the following day several blue petrel were seen. They seem to go further south into the ice on the approach of boisterous weather.

The ship was put under sail for the night, making some 5 to 6 miles to the north by the morning of the 19th. The day turned out snowy and misty, the wind blowing up to a moderate gale from the south-west during the afternoon. Our position at noon was 63° 0′ S., 52° 5′ W. At midnight the clouds over the whole sky were tinged of a deep red. We lay still all night.

The morning of January 20 broke with dense fog, and light W. to W.S.W. breezes. The fog gradually thinned away, until at last we could see blue sky through it. At this time we were lying in fairly open water—no ice to be seen from the deck. There was a considerable northerly swell running. Soon after 11 a.m. the day cleared up, with blue sky and bright sunshine. Steam was started to S.S.W. Observations were got at noon. The captain reported that we were "90 miles off the land," and that the magnetic variation was "15° E." Our position at this time was lat. 62° 58′ S., long. 52° 44′ W. Soon after noon, a large berg, about 10 miles long, was seen 5 or 6 miles to the westward. The afternoon was spent in sealing. The seals were scattered, and mostly of the large spotted variety. We lay to for the night at 8 p.m., having made in all about 20 miles on a S.W. by W.$\frac{1}{2}$ W. course (true).

January 21 turned out very much the same—foggy in the morning, and clearing up splendidly soon after 9.30 a.m. At 2 p.m. the temperature in the shade stood at 40·7° Fahr. During the day a very gentle westerly wind blew, bright sunshine continuing until after

7 p.m., when the wind changed to south, and fog came down. Steam was started at 8 a.m., and kept up more or less steadily until 10 p.m. We had made 45 to 50 miles on a S.W. $\frac{1}{2}$ W. (true) course. But little sealing was done during the day; the ice was mostly in loose streams. At midnight several grampuses were seen playing about the ship's quarter. Our position at noon was 63° 15′ S., 53° 13′ W.

Steam was started again at 5.15 a.m. on the 22nd, and kept up till 11 hours, about 20 miles being made to the S.S.W. The day was bright and sunny, with light westerly winds or calm. At 11 hours sealing was commenced, the other four ships being in sight to the S.W. and S. The yellow seals were numerous, in "patches" of from ten to sixteen, with occasionally a single spotted seal on the same piece of ice. During the evening numerous cetaceans, somewhat resembling the grampus, were seen, of the exact species of which I am still doubtful. At 10 p.m. we made fast to a piece of ice, and spent a couple of hours in filling our water-tanks. Position at noon, lat. 63° 48′ S., long. 54° 16′ W.

January 23 was spent in sealing, within a few miles of our position in the evening. All the five ships were within 5 miles. During the forenoon the atmosphere was calm and remarkably clear. Some snow fell during the afternoon and evening. The seals were mostly of the large black variety, some of them measuring 12 and 13 feet in length. The ice was in loose detached streams. Our position at noon was lat. 63° 52′ S., long. 54° 33′ W. The barometer fell 0·2 inch during the day, from 29·203 inches, and continued falling until noon on the 24th, when it stood at 28·834 inches.

During the 24th the wind blew freshly or strongly from the E. to S.E., with some snow and mist. We spent the day in company with the *Jason*, slowly steaming head to wind. In the evening I went on board of her, and met Captain Larsen. He is a frank and very pleasant man, and one who seemed to take an enthusiastic interest in everything connected with the expedition. He had made the ice much further east than the Scotch ships, and had landed on the South Orkneys. He describes a variety of crested penguin as seen there, which is in all probability a new species. He states that in lat. 64°, long. 45° to 46°, he saw large flocks of the great penguin—in all probability the emperor. None of the smaller sizes were seen in the vicinity of these flocks or schools. He also landed on Seymore island. There he got a number of fossil shells and pieces of fossil wood, and a few round stone balls with a concentric arrangement of layers—to all appearance an old lava bomb.

Though we saw any quantity of these fossils and balls, we saw no signs of vegetation. Some of the fossils are at present in the hands of Prof. James Geikie, who has kindly promised to examine them along with some other geological specimens.

At 9 p.m. all the five ships were within a mile. A slight easterly

swell made itself felt during the day. We made not more than 10 to 15 miles to the south. Our position at noon was 63° 57′ S., 54° 36′ W.

The following three days were spent sealing to the south and west of this position. The weather was fine, with some amount of sunshine, and light southerly and easterly breezes. The ice was in the form of loose packs and streams. Several bergs were in sight, mostly out to the eastward. The penguins were very numerous on the 27th, being seen in flocks of fifty to a hundred on one piece of ice. During the calm evenings of the 26th and 27th I stood for several hours on the bridge, watching the finners playing and jumping about the ship. Our position at noon on the 27th was lat. 64° 16′ S., long. 55° 18′ W.

January 28 was spent in a similar manner. Shortly before 8 p.m. the wind began to rise from the south, and blew freshly for the rest of the night. At midnight we were lying on the weather side of a chain of bergs, towards which wind and tide were both sweeping, forcing us to steam out into more open water, where we hove to for the night. Our position at noon was lat. 64° 18′ S., long. 55° 26′ W.

During the night and morning of the 29th the wind steadily rose, and by noon had reached a moderate gale. During this and the following three days the gale continued, at times blowing a strong gale (force 9). The same tactics were observed during the four days. We lay in an open pool of water in the lee of a heavy ice-stream, which completely broke the force of any sea or swell occasioned by the gale. Fast though this stream drifted, we drifted somewhat faster, and were thus forced to steam head to wind at intervals of about two hours to regain the shelter. We drifted on the average about 30 miles a day, there being a current in addition to the wind, setting to the north and east. During most of the four days there was a crossed southerly and north-easterly swell.

The barometer, which on the 27th had been up to 29·582 inches, gradually fell during the four days, reaching 29·900 inches at 4 a.m. of the 31st; then, after rising to 28·952 inches, made another drop to 28·880 inches at 4 a.m. on February 1, after which it steadily rose. A considerable quantity of light drizzling snow fell during the continuance of the gale. The general direction of our drift was N.N.E., and we must have passed within 14 miles of the Danger islands—without seeing them, however, as we passed them during the night of the 30th and morning of the 31st. A few birds kept company with us, chief among them, both in size and number, being the great dusky petrel. The others were the stormy petrel, the cape pigeon, the beautiful snowy or white petrel, and a variety of tern. Very few penguins were seen. On the 31st a white-headed penguin, the *Pygoscelis papua*, was seen swimming about the ship and giving vent to its extremely harsh "Quaugk, quaugk."

On February 1 another school of those cetaceans mentioned on

January 22 was seen. The grampus and several finners were also seen. Numerous seals of the spotted variety were scattered over the stream to windward of us. While drifting in this way I kept a tow-net constantly dragging in our wake, though with occasionally but small result. All the best nettings were got during the night. During the afternoon the wind began to moderate, and between 7 and 8 p.m. was sufficiently down to allow of us making steam to the south. We made a southerly and westerly course for three hours, and then lay to for the night in shelter of a small ice-stream. Our position at noon on this day was lat. 62° 44′ S., long. 53° 56′ W. The total drift during the four days was roughly 110 miles.

On February 2 the wind still blew from the south and east, but was down to a light breeze. Steam was kept up in a more or less southerly direction from 4.30 a.m. to 7 p.m. At 2 p.m. part of Joinville island was sighted to the S.W., the course being then changed to about S.S.E. At 2 p.m. we came across a small ice-stream somewhat thickly covered with large spotted seals. Five boats were sent away, and about 2½ hours sufficed to clean the "patch." We then lay to for the night. Our position at noon was 63° 1′ S., 54° 32′ W.

February 3 broke clear, though overcast, with a gentle breeze from the south and east. We steamed from 7 to 11 a.m., doing about 10 miles to the south, after which the ship was put under sail in order that some necessary repairs might be executed on the engine. Land was in sight all day to the S.W. and S.W. by S. This, I have little doubt, belonged to the Danger islands. Our position at noon was lat. 63° 29′ S., long. 54° 17′ W.

The 4th brought us a return of bad weather. Strong winds from the S.E. to S.S.E., with heavy snow, fog, or mist, prevailed, throughout the day. The ship was kept manœuvring in shelter of various small ice-streams. We had the *Balæna* in sight to leeward during the afternoon; at 9 p.m. the captain and I went aboard of her and spent a pleasant evening. Very heavy snow was falling as we returned to the *Active* at midnight. Our position at noon was lat. 63° 22′ S., long. 54° 15′ W. The following day did not present any very marked improvement; we continued drifting about among loose ice-streams, and occasionally steaming to windward. Position at noon, 63° 17′ S., 54° 14′ W.

The morning of February 6 was overcast, but the sky was brightening all along the horizon. A gentle southerly breeze blew during the forenoon. Shortly after 9 a.m. the day cleared up, blue and bright sunshine continuing for the rest of the day. Steam was started about the same time to the S.E. by E. ½ E. From 4 p.m. up to about 9 the *Balæna* and we steamed in company making a course about S.E. ½ E.; and then we made fast to a piece of ice, and spent a few hours in watering the ship. During the forenoon we had the north-eastern part of

Joinvile island in sight, our position at noon being lat. 62° 24′ S., long. 54° 4′ W. During the afternoon it fell quite calm, after which a breeze sprang up from the W., changing to N.N.W. During the night it blew a strong breeze from the N.W., with four hours' snow. Shortly after 6 a.m., the wind having fallen, dense fog came down, and continued more or less till 11 hours. At 10 the fog had thinned considerably, and blue sky could be seen through it overhead. The positions of bergs could be made out by the brilliant whiteness of the fog immediately over them. To the westward we saw a beautiful fog-bow, called by the sailors a "fog shaffer;" as we stood on the bridge the two ends seemed to meet under our feet. This is a very common phenomenon in Greenland. It is believed by the sailors to eat up the fog. At 11 a.m. steam was started to S.E. by E., the *Balæna* being sighted on the port quarter. Bright sunshine continued throughout the day. At noon the dry-bulb stood at 40·4° Fahr.; on exposure to the sun, it rose to 51° Fahr. During the afternoon numerous finners and grampuses were seen. In the evening, about 6 p.m., the atmosphere was very clear; there was a great amount of refraction, the ice twenty miles off appearing thrown up into the sky to a height of 10° or 12°. I went on board the *Diana;* she and the *Jason* had just come north from about 65° S., and reported nothing but berg ice in large sheets, no very open water being seen, as one would have expected after the long continuance of southerly winds. They said they could have got further south, but saw no advantage to be gained from it, so returned. The seals prefer the rough, loose pack ice to those flat stretches of bay ice. Dense fog came on at 11 p.m., but thinned away very rapidly soon after. Light W.N.W. winds prevailed throughout the day. Our position at noon was lat. 63° 55′ S., long. 53° 10′ W. Our distance for the day was about 35 miles. Numerous bergs were seen, more especially out to the eastward.

During the morning and forenoon of the 8th the wind was northerly, with fog and rain. At noon a small fog-bow was seen, and soon afterwards the fog lifted. At 3 p.m. the wind suddenly veered to S.W., and rose rapidly. The dry-bulb fell quickly below the freezing-point, and snow took the place of the previous rain. It blew a fresh gale all night, taking off during the morning of the 9th. The general direction was about S.S.W. During the afternoon the wind fell to a light air, and shortly after 8 p.m. changed to N.N.W. During these two days we made about 44 miles, in a direction about N.E. by N. Our positions at noon on the two days were: on the 8th, 64° 15′ S., 52° 28′ W.; on the 9th, 63° 51′ S., 51° 54′ W.

Heavy fog came down at daylight on February 10, gradually dispersing during the morning before a light N.N.W. breeze. During this and the following days we saw numbers of white-throated penguins. These I believe to be the young of *Dasyrhamphus adeliæ* (H. & T.), and

not a separate species, as described by Dr. O. Finsch. Our position at noon was 63° 38′ S., 51° 45′ W. We made some 8 to 10 miles in a N. by W. direction during the day.

February 11 we spent sealing in a small field of pack ice. There were several bergs in the field or immediate neighbourhood, which seemed to move at a considerable speed in a northerly direction, cutting a path through the pack. The ice, especially during the afternoon, was reeling about a great deal without apparent cause, and threatening to enclose the boats, and even the ship itself. Our position at noon was 63° 33′ S., 51° 49′ W. At 9.30 p.m., dense fog came on, and lasted all night. The barometer was fairly steady, averaging for the day 29·254 inches.

The fog continued with little or no wind up to 9 a.m. of the 12th, when the wind began to rise rapidly from the S.S.E., light snow taking the place of the previous fog. By noon it was blowing a "moderate gale" from the S. by E., rapidly increasing to a "strong gale" at 4 p.m. The ship was simply allowed to drive before the gale, through loose ice-streams or pack, only steaming clear of the larger pieces or bergs. The barometer fell up to 8 p.m., when it read 29·030 inches, and after which it began to rise. The gale continued throughout the night.

At 2 a.m. on the 13th, we drifted in the darkness close to the weather side of a berg, getting at the same time entangled in some heavy pack ice. Happily, we got clear without accident. The gale continued, though somewhat abated in force, up to 4 p.m. The readings of the dry-bulb for this day averaged 26·2° Fahr., being the second lowest daily average recorded. Our midday positions for these two days were: the 12th, 63° 25′ S., 51° 51′ W.; the 13th, 62° 31′ S., 52° 2′ W. During the continuance of this gale we drifted nearly 80 miles to the north.

February 14 turned out bright and sunny, with light south-easterly and northerly winds. During the forenoon an island was sighted bearing N.W. This must have been Clarence island, though seen at a distance of nearly 60 miles. The clear atmosphere and great refraction made this quite possible. The day was spent in sealing amongst loose ice; our position at noon was 62° 1′ S., 52° 5′ W. We made a few miles to the south and west during the day, the same being true of the three following days. On the evening of the 15th we had a very marked and sudden change of weather. Within two or three minutes the wind went round from N.N.W. force 2 to S.S.E. force 7. Hard frozen snow immediately took the place of the previous drizzling rain. All the temperatures went down instantly, and the barometer began to rise within five minutes. Our position on the 17th was lat. 62° 21′ S., long. 52° 57′ W. On the evening of the 17th, while on board the *Jason*, Captain Larsen informed me that, when in lat. about 64° 40′ S., long. 56° 30′ W., he had seen land out to the west and south-west. This

statement is corroborated by Mr. Burn Murdoch, of the *Balæna*. In all probability this is the east coast of Graham's Land. Sir James Ross must have been within sight of this land, had the weather been clear, when lying beset off Cape Lockyer. On this day, the 17th, the readings of the dry-bulb averaged 24·1°, while the sea surface-temperature averaged 30°, both being the lowest reached during the cruise. A strong southerly wind blew all day.

On the 18th the wind went round to the north, bringing mild weather, and fog or mist. During this and the following two days we made a little over 20 miles to the westward. On the afternoon of the 19th, I had an opportunity of observing a small berg turn half over within 25 yards of the boat in which I was. Though a considerable disturbance was caused, we received no damage beyond a wetting. During the afternoon of the 20th, which was marked by brilliant sunshine, a great number of the yellow seals were seen in the water, moving in an easterly direction. Our position at noon on the 20th was lat. 62° 32′ S., long. 54° W.

During the next three days our position was not materially altered, only some 15 to 20 miles being made to the southward. On the 23rd our position was 62° 43′ S., 54° 9′ W. On the night of the 23rd we had very heavy rain, which froze as it fell, coating everything—ropes, boats, decks, etc.—in a sheet of transparent ice. The barometer fell nearly half an inch during the 23rd—the midnight reading being 28·778 inches—and continued falling until shortly before 8 a.m. of the 24th, when it stood at 28·660 inches. The wind rose from the S.W. to a moderate gale, but fell again as the afternoon wore on. At 11 a.m., on February 24, with the *Diana* in company, steam was started for the Falkland islands, on our way home. Our position at noon was lat. 62° 45′ S., long. 54° 18′ W. On the 25th we found ourselves in 62° 15′ S., 55° 16′ W.; and on the evening of the same day we sighted Aspland and O'Brien islands—belonging to the South Shetlands—out to the north-east. On this day, too, we saw our last iceberg.

On February 26 we again saw albatrosses for the first time since November 17, our position being lat. 60° 37′ S., long. 56° 43′ W. After a somewhat stormy passage of nine days, we anchored in Port Stanley, Falkland islands, on the evening of March 5, having been absent from them exactly twelve weeks. After a pleasant though somewhat slow voyage home, we landed in Dundee on June 11, 1893.

ANCIENT TRADING CENTRES OF THE PERSIAN GULF.

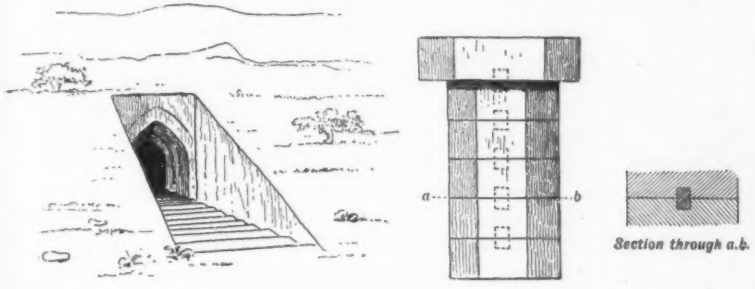
By Captain ARTHUR W. STIFFE, R.I.M.

II. KAIS, OR AL-KAIS.

THIS island, the successor of Siráf and predecessor of Hormuz as an emporium of trade between the West and East, lies off the Persian coast of the Persian Gulf, from which it is separated by a fine navigable strait 9 miles wide. It is of low appearance and convex profile, rising gradually from a rocky shore to a height of 120 feet above the sea in the centre. The length from east to west is 8½, and its breadth 4½ geographical miles. It contains at the present day many small villages, and a large one called Máshi, standing on the north-east corner, lat. 26° 34′ N., long. 54° 2′ E. Máshi is inhabited by about 500 Arabs of the Al 'Ali tribe, who are all pearl-fishers, and send out a large number of boats to the banks, which lie off the Arab coast. It is built of the usual Arab houses of mats made of the stalk of the date fronds, with two square masonry castles, and is nearly a mile in length along the beach. The other villages are also inhabited by Arab pearl-fishers, but have only a few boats each. There is some cultivation, especially on the north coast, with scattered small plantations of date and other fruit trees. On the island also are large flocks of sheep and goats, and some cattle. The interior of the island is rocky and barren, sparsely grown with stunted shrubs and herbage, on which the flocks feed. We visited the island several times in 1857 during the survey. This island, in common with all the others in the gulf, suffered severely from the depredations of the Joasmi pirate Arabs in the beginning of the century, when they were mostly depopulated, and have been only gradually reoccupied since the establishment of British supremacy. It now belongs to Persia, and was then subject to the chief of Chárek.

Near the centre of the north coast are the extensive ruins, now known to the people of the island as Haríra, of the old city, once the head-quarters of the trade with the East. They extend half a mile along the shore, and consist chiefly of mere mounds of stones and fragments of masonry, and the ground is strewn with fragments of pottery and Chinese porcelain, of which latter I have placed some in the British Museum. Of the large mosque some remains exist. A fine minaret of well-cut stone, which was standing only a few years before our visit, lay in heaps of ruin. The fallen pillars of the mosque lay around just as they had fallen; they were of cut stone, octagonal in section, and the several courses had a hole through the centres, evidently for the purpose of dowelling them together. There are several large water-cisterns of oblong shape, which had been roofed in, but the arched roofs had fallen in, partially filling up the cisterns with the *débris*. Two of these measured each 150 feet by 40, and

were still 24 feet deep. They were lined with masonry inside, and cemented. Near these begun a fine kanát,* or subterranean aqueduct, of better execution than those generally seen at the present day. It was cut in the solid rock, and carried at a depth of 20 feet or more from the surface; there were about forty shafts, 15 to 20 yards apart, so that its length was nearly half a mile. Four of these shafts (see sketch) had steps cut in the rock, 4 feet wide, to descend by. There were twenty-three steps in one that I descended. The bottom of this aqueduct was partly choked with rubbish, and there was no water in



it. The pointed vault over the steps, cut out of the rock, was 9 feet high.

There are ruins of smaller extent at other points on the north coast of the island. We could not find or hear of any inscriptions, or of coins being found. The stone of the island is not very durable—a coarse shelly calcareous breccia of probably late Tertiary age.

The ruins are thus much less extensive than those at Siráf (Tahiri); indeed, the prosperity of the city was, as we shall see, not of long duration. The plan shows the position of the town, and the sketch one of the staircases leading to the kanát. As there is no harbour in the island, the anchorages being open to one or other of the prevailing winds, the "ships" were probably hauled up on the beach, or inside the reef, as they seem to have been of small burden; or, in certain seasons, they may have anchored off the north-east point, which is a safe anchorage except in the winter easterly gales.

Of the history of this place, only scanty fragments have been handed down to us. Sir W. Ouseley † relates a curious legend which he considers, on the authority of a Persian manuscript, may be assigned to the tenth century, as to the first settlement on the island. It sets forth how one Kais, a son of a poor widow of Siráf, embarked for India

* A kanát is made by sinking a line of pits to the water-level, and connecting them at the bottom by short tunnels, the bottom being slightly inclined to allow the water to flow along it.

† 'Travels in Various Countries of the East, etc., in 1810–12.' London: 1819.

with his sole property, a cat. He arrived there at a time when the king's palace was so infested by mice or rats, that they invaded the king's dinner-table, and persons were employed to drive them from the royal banquet. Kais produced his cat, the noxious animals soon disappeared, and magnificent rewards were bestowed on the adventurer of Siráf, who returned to that city, and afterwards, with his mother and brothers, settled on the island, which from him has been denominated Kais, and so on. I doubt whether much importance can be attached to this myth, which may possibly be the original of the similar English tale.

The island is not mentioned in Ebn Haukal's geography (middle of tenth century), and the earliest reference to it which I have been able to find is in the Sefer Nameh,* where the name only of the island is given in the text, but in a note the learned translator says, "Ibn Moujávir,† in his 'Tarikh Mostanssery,' has a chapter on the island. He says it is of 3 square farsangs, abounds in date trees and plantations of Garazh" (probably the hardy acacia called Ghâf at the present day), "the property of the king. It is sufficient to make a hole with the hands in the sand to obtain fresh and pure water. A subterranean canal" (see description, *ante*), "dug by the kings at a former period, runs through the garden of the prince, fed by water coming from springs and streams, and it fills the reservoirs. The houses in stone and plaster are very high, as much as seven stories,‡ and each one is a fortress." The island owes its name, "according to some, to Qais-ibn-Moulawah, others to Imr-el-Qais, but the most correct is that which attributes it to Qais-ibn-Zobair. The prince of Qais has neither cavalry nor infantry; all the people of the island are mariners. They eat only fish pounded (pilé) with dates. The king has a monopoly of building stone (grès) and bamboos."

Rabbi Benjamin, of Tudela § (A.D. 1164 to 1173), apparently visited the island, but his account is not very intelligible, as he was not a geographer. It appears he sailed from the Tigris, "which runs into the Indian sea, or Persian Gulf, and passes the island Nikrokis." This name has given rise to various conjectures. One commentator explains it Nikra = called, Kis = name of island; however this may be, it is doubtless meant for that place. He says the island is six days' journey in extent (an exaggeration); has only one canal of fresh water, and they gather water during rain in cisterns; the land is not cultivated; and he goes on to say, "This island is famous for commerce with India and the

* 'Sefer Nameh.' By Nassir Khosran, 1035-42. Traduit per Ch. Schefer. Paris: 1881.

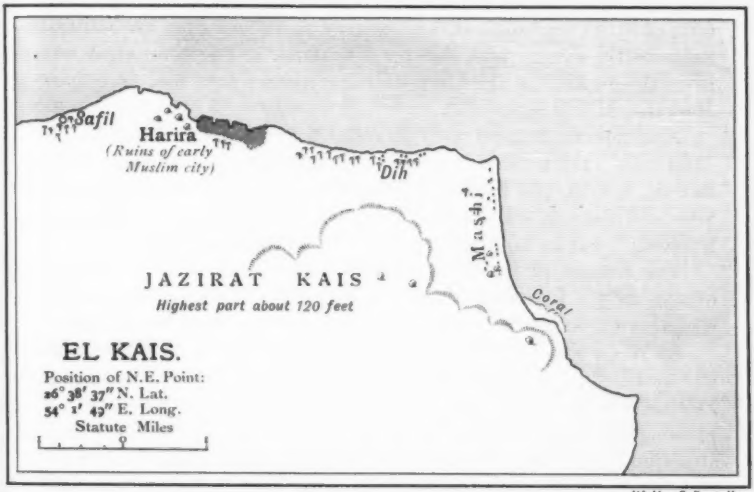
† This author, whose full name was Jemal-ed-din Abul-Fath-ibn-Yakoub-el-Dimichqy, composed a treatise of geography in 1226-42, dedicated to the Kaliphah Abu-Jafar-Mansur-Mostansser. I give the abstract of M. Schefer's quotation here, although, in point of time, the author is later than Yakút.

‡ Such high buildings of many stories may be seen at the present day, as at Linga; they are an Arab type of building.

§ Kerr's Collection.

islands of the Indian sea and Sennar (China?), Arabia, and Persia. The traveller thence went to Katíf, and so on to India and Ceylon."

I have not been able to discover the date of the original settlement of this place, but conjecture there was some settlement here from the Arab coast before 1100 A.D., and that it grew into predominance when Siráf was abandoned, as I have elsewhere suggested, after 1200 A.D. Yakút al Rumí, whose book * dates from 1218 A.D., refers to it as a fine and picturesque island surrounded with gardens and houses. He continues, "In this isle are the vessels which trade with India; there are numerous cisterns supplied by rain-water, and good, well-stocked bazaars. It is



Walker & Boutall sc.

the residence of the King of Oman, who is respected by the sovereigns of India on account of his naval strength and riches, and all the neighbouring isles belong to Kisch. His features are Persian, and costume that of Deilim" (a port in the north-east angle of the head of the gulf). He also mentions the pearl fisheries. It is stated that Yakút personally visited this place, as also Siráf, which latter he found almost deserted.

Edrisi,† whose book dates from the latter half of the thirteenth century, states that the trade of Sohar with China sea "has now ceased." Sohar is in the Arabian country of Oman, formerly of importance, and still existing as a port. He assigns the following as a reason: "A certain governor of Yemen possessed himself of an island called Kish, in the centre of the Persian Gulf, and opposite to Maskat"—this is not

* 'Dictionnaire geogr. de la Perse, from Yaqout.' By C. Carbier de Meynard. 1861.

† 'Geographie d'Edrisi.' Translated from Arabic into French, with notes, by P. Amédée Jaubert. Paris: 1836.

correct—"fortified and peopled it, and equipped a fleet, by means of which he became master of the littoral of Yemen. He did much damage to trade and merchants, plundering them so that the commerce was diverted to Aden. With his fleet he ravaged the coasts of Zenj (Zanzibar) and Ghamran. The inhabitants of India fear him, but resist him with vessels called el-Mechiât, which, although made of a single piece of wood, are capable of carrying up to two hundred men." Large canoes, carrying about thirty men, are at the present day in use at some places on the Arab coast, but the above number is doubtless an exaggeration. The account then continues, "The governor of Kish is reported to have fifty of these vessels, all of one piece, besides many others. He still continues his depredations, and is very rich. At Kish are cultivated fields, cattle, sheep, vines, and pearl fisheries." The account, however, gives the distance of the isle from Sohar as two days' sail, and *one* from Maskat, which is incorrect.

Abulfeda, in his geography (translated by M. Reinaud, 1848), which dates from 1273 to 1331 A.D., mentions the island, "between Ind and Basrah," also the pearl fishery, and says there are many orchards and palm trees and water in wells, and that "the people are well brought up and behaved;" but he says nothing about the town or the trade.

The account of Ibn Batuta (1325–54 A.D.) is to me unintelligible, except on the assumption that he confuses Siráf and Kais, and has compiled a description from other sources than personal knowledge.

Sir W. Ouseley (*op. cit.*), who went up the Persian Gulf in H.M.S. *Lion*, and anchored on the north side of the island, but did not land, says that Zakaria Casvini (who died in A.D. 1275) states that the town is of pleasing appearance, with a castle and many gates, gardens, and various structures, "so that it is one of the most delightful places in our time," and that the island was the resort of ships from Persia and Arabia for commercial purposes. Hamdallah Cazvini, a writer of the following century, mentions it in similar terms.

Further on, Ouseley states that Ahmad al Ghafari records that the prince of Hormuz (which town then stood on the mainland), Shehab-ad-din Ayáz, purchased the island of Gerun (Hormuz) from the kings of Kish, and began to build there about A.D. 1302.

This is confirmed by Mirkond's history,* where it is stated that the name of the king of Keys was Neyn, and that all the islands in the Gulf of Persia belonged then to Keys. This history, which was written before 1378 A.D., says that Keys, so called by the Arabs and Persians, is a small island, once the head of a kingdom, though now not inhabited, "since the trade has fallen off for fear of certain pyrates continually infesting that sea." It formerly had "all the trade that has since been removed to Harmuz." The building of the city on the island of

* The history of Persia, etc., to which is added an abridgment of the lives of the kings of Hormuz . . ., now rendered into English by Capt. Jno. Stevens, 1715.

"Harmuz" is given as 1302, under King Ayaz. The next king of Hormuz, Gordon Shah, was soon at war with Neyn, king of Kais; he was assisted by the governor of Shiráz, and after varying fortunes Kais was reduced to subjection about 1320 under his successor, Mir-sha-Kodbadin, from which date I can find no mention of it, so that it may be presumed to have lapsed into insignificance.

I take the following information from Hammer-Purgstall,* referring to an earlier war with Hormuz. He begins by stating that the most brilliant of the conquests of Abubekr (the Attabeg king of Persia) is that of the island Kais, or Kish, and Bahrein. The first of these islands is called after Kais, one of three sons of Kaissar, a shipowner of Siráf, the haven and emporium of the Southern Persian coast. [Then follows the story of the cat, nearly as already given.] The sons of the widow became mighty shipowners, and extended their operations to the coasts of India, etc. They built on Kais a great palace, which they called Aferide, and which rivalled the palace of Adhad-ed-Doulat at Naband,† and the Hall of Columns, attributed to the same person, at Siráf. The Khalífah, Nassir-ed-dín-illah, gave them the lordship of Kais with the title Sultan-ibn-al-Malik-Jamshíd. Thus the Beni-Kaissar, whose very existence, as well as that of the Beni-Amara in Fars, has escaped European historians, reigned on the island of Kais, until Seyf-ad-din-Abu-Nadhr-Ali-bin-Kaikobad, the lord of the island Hormuz,‡ offered the Attabeg king of Fars his assistance in the conquest of Kais in A.D. 1229. The commanders of the Garmsír (the hot coast of Persia on the gulf) were ordered to subdue Kais, and the Malik Jamshíd was killed. This war is represented in Mirkhond's history (*vide ante*) as a merely domestic war between Kais and the Hormuzians, which latter did not retain possession of the island, although it was overrun by them under Seyf-ad-din, as already stated, at a later period.

DIAGRAM FOR DETERMINING THE PARALLAXES IN DECLINATION AND RIGHT ASCENSION OF A HEAVENLY BODY, AND ITS APPLICATION TO THE PREDICTION OF OCCULTATIONS. §

By Major S. C. N. GRANT, R.E.

THE diagram was designed for the purpose of obtaining rapidly, and with some degree of accuracy, the parallaxes in declination and right ascension of the

* 'Geschichte der Ilchane.' Von Hammer-Purgstall. Darmstadt: 1842. I have somewhat modified the German orthography, as *j* for the cumbrous *dsch* (the only way of expressing the sound in German).

† A village where there are many ruins, situated to eastward of Siráf.

‡ This is a mistake; Hormuz was *not* at that time on the island. I do not find the authorities given throughout in von Hammer's history; it is doubtless in part from Wasáf.

§ Diagrams, p. 688. Separate copies of this paper with the diagrams mounted may be obtained by application at the Society's rooms.

moon, and the practical use to which the parallaxes, so obtained, were put was that of predicting the elements of occultations of stars by the moon preliminary to making observations for the determination of longitude.

The generally accepted systems, both theoretical and graphic, of calculating the local elements of occultations are somewhat long and tedious; whereas the system to be described in these notes is rapid, simple, and sufficiently accurate for practical purposes.

The diagram itself represents an orthographic projection of the Earth, showing parallels of latitude and hour circles; the line OO represents the projection of the equator, and the projections of the parallels of latitude are drawn at intervals of 5°. The divisions on the circumference of the circle, however, give the positions of parallels to each degree, and as the intervals between these divisions can be divided into four parts, latitude can be plotted to 15′.

The hour circles are drawn only on the eastern half of the circle, and a portion of the north-west quadrant. They are numbered in two ways—one from O at the centre to VI. at the east circumference; and the other from O at that circumference to VI. at the centre, and continued to VII. and VIII. beyond the centre. The use of these two systems of numbering will be explained hereafter. Where the space permits, the intervals between the hour circles have been subdivided into spaces representing five minutes; the hour nearest the circumference is divided only into spaces of fifteen minutes. Near the centre of the circle these divisions can be subdivided by eye into five parts, each part representing one minute, which may be taken as the limit of accuracy to which the hour angle can be plotted, and consequently need be calculated. The accuracy, however, decreases as the divisions become smaller near the circumference and in high latitudes.

In the south-west quadrant, the radius of the circle and the radii of all the declination circles up to 32°, the limit of the moon's declination, are divided into scales of one hundred parts.

To determine Parallax in Declination.

Rule—Plot on the diagram the position of the place of observation from its known latitude and the hour angle, counting the hour angles from *right to left*—that is, from the circumference towards the centre. Call this point A. Draw a straight line through the centre of the circle and that division of the circumference representing the moon's declination, above or below the line OO according as the declination is north or south, and in the same side of the circle as that from which the hour angles commence to count. Denote this line by CB.

The length of the perpendicular drawn from the point A to the straight line CB, produced if necessary, is a measure of the parallax in declination. With a pair of compasses, find what proportion the length of this line bears to the radius of the circle, which is divided into a hundred parts on the diagram; multiply this proportion by the horizontal parallax of the moon, and the product is the parallax in declination.

Let us take an example—

Latitude, 10° 30′ N.; moon's declination, 20° 50′ 30″ N.; moon's horizontal parallax, 59′ 16″; hour angle, 1h. 40m.

On the diagram the point A is plotted at lat. 10° 30′ N., and hour angle 1h. 40m., counting the hour angles from the circumference towards the centre as numbered in the lower line of figures. CB is drawn through the centre C and the division on the circumference representing the declination 21° N. approximately.

If the diagram represents an orthographic projection of the Earth on a vertical plane passing through the centres of the Earth and moon, the point A and the

line CB are the projections of the place of the observer and of a line joining the centres of those two bodies.

AD, being the perpendicular dropped from A on to BC, is a measure of the parallax. The length of AD is found on actual measurement to equal $\frac{15}{100}$ of the radius FC of the circle; so that—

$$\begin{aligned}\text{Parallax} &= \tfrac{15}{100} \times \text{horizontal parallax} \\ &= \tfrac{3}{20} \times 59' 16'' \\ &= 8' 48''\end{aligned}$$

Were the declination south instead of north, the parallax would be represented by AD′; this equals $\frac{49}{100}$ of the radius, and the parallax would equal—

$$\tfrac{49}{100} \times 59' 16'' = 29' 0''$$

In some cases the hour angle may exceed six hours, and the line of the moon's declination may require to be produced through C; for instance, the line EF represents the parallax in declination under the conditions—latitude, 45° N.; hour angle, 6h. 45m.; declination, 30° S.

The Sign of the Parallax in Declination.—If the place of observation as plotted in the diagram is below the line drawn through the centre and the declination, the effect of the parallax will obviously be to move apparently the position of the moon towards the north; it will thus increase north and decrease south declination. The converse is also true. Thus, in the first example the parallax represented by AD would be added to the moon's north declination; that by AD′ would be added to the moon's south declination; and that by EF would be added to the moon's south declination.

Parallax in Right Ascension.

The diagram now represents a similar projection on a vertical plane at right angles to the former, and the hour angles should be plotted from the vertical line passing through the centre of the circle, and counted as numbered in the upper series of figures. If from the point plotted by latitude and hour angle a perpendicular line be drawn to the centre vertical line, the length of this perpendicular is a measure of the parallax; but instead of being, in all cases, measured on the radius of F C of the circle, as in finding the parallax in declination, it should be measured on the scale of the radius of that declination circle representing the moon's declination. These radii for declinations from 0° to 32°, which covers the range of the moon's declination, are divided each into one hundred parts in the south-west quadrant of the figure. The proportion of the perpendicular to the radius of the particular declination circle, multiplied by the moon's horizontal parallax, is the parallax in right ascension.

Both parallaxes will be in terms of arc or time, according as the horizontal parallax is stated in arc or time.

Let us take, as an example, the same values as those in the first example of parallax in declination. The point G represents the place of the observer plotted at latitude 10° 30′; whether north or south is immaterial, and 1h. 40m., the hour angles being counted, as before explained, from the centre outwards. GH, the perpendicular let fall from G on to the centre meridian, is a measure of the parallax. The moon's declination is practically 21°, and so GH is measured on the scale JK, and equals forty-five parts, so that—

$$\begin{aligned}\text{Parallax} &= \tfrac{45}{100} \times \text{horizontal parallax} \\ &= \tfrac{9}{20} \times 59' 16'' \\ &= 26' 36'' \text{ (arc)} \\ &= 1\text{m. } 46\text{s. (time)}\end{aligned}$$

Sign of the Parallax in Right Ascension.—If the sidereal time at place exceeds the moon's right ascension, that is, if the moon is to the west of the meridian, the effect of parallax is to decrease the moon's right ascension. The converse is also true.

The most convenient way of using the diagram is to cover it with a piece of tracing-paper, and to draw a line on the tracing-paper across the diagram at the latitude of observer's station. Place a ruler to represent the line joining the centres of the Earth and moon. Then with one leg of a pair of compasses on the point at which the hour circle cuts the latitude line, adjust the other leg so that, when swept round, it touches the edge of the ruler in one case, or the central meridian in the other; the compasses are then open to the length of the perpendicular, and the proportion to the particular radius can be scaled off at once. These proportions can be conveniently multiplied by the horizontal parallax by means of a slide rule.

The Nautical Almanac gives the elements of occultations as they would be seen from the centre of the Earth, and although the limits of latitudes between which the star may be occulted are stated, this does not mean that the star will be occulted as seen from every place within the limits stated, but rather that outside these limits the star cannot be occulted. Again, although an occultation may be visible, the star's apparent path may so approach a tangent to the moon's disc as to render the results obtained from the observation of such an occultation unreliable. The time of occultation may, owing to the effects of parallax, be any time from about two hours before to the same interval after the time of conjunction as given in the Nautical Almanac. These circumstances render it desirable to determine, before attempting to observe an occultation, whether the star as seen from the observer's station will be occulted at all, and if so, at what time approximately it may be looked for, and at what portion of the moon's disc the star will disappear and reappear. The simplest way of doing this is to draw to scale the position of the star, and relatively to it the path of the moon as affected by parallax.

A form showing the small amount of calculation necessary is given on p. 653.

In the instance worked out, the G.M.T. of geocentric conjunction is 17h. 48m. 18s., and the calculation is commenced with the view of finding the parallaxes at 17h. and 18h. so as to plot the position of the moon at those two times, and from those positions as plotted, to draw the path of the moon's centre. Before we can plot the parallaxes off the diagram, the hour angles must be determined, and the first portion of the calculation is for this purpose. The hour angle at 17h. is found to be 1h. 48m. 40s., and since the sign is + the moon is on the west of the meridian. This, according to the rule before stated for the sign of the parallax in right ascension, throws back the moon in right ascension, and, as far as the effect of that only is concerned, delay the time of conjunction; so that we may infer that this time, instead of being between 17h. and 18h., will probably be between 18h. and 19h., and it will consequently be better to plot the position of the moon at those hours, and the hour angles for those two times are noted down. It is not necessary to recalculate the hour angles, but for each difference of one hour of G.M.T. add *algebraically* about 58m. to the hour angle. That is to say, when the moon is on the west of the meridian the hour angle may be considered positive and is increasing, and when the moon is on the east of the meridian the hour angle may be considered negative and is decreasing.

The moon's horizontal parallax and semi-diameter are next taken from the N.A.; they should be corrected approximately to time of occultation.

The remainder of the calculation consists simply in applying the parallaxes, scaled from the diagram, to the right ascensions and declinations of the moon taken from the N.A., and in taking the differences of the right ascensions and declinations

as well as those of one of the positions of the moon and of the star. These differences are taken out only to facilitate plotting the relative positions on a figure or drawing. See that the right ascensions and their parallaxes are stated both either in time or in arc. The figure (p. 688) is constructed as follows:—A is taken as the position of the moon's centre at 18h. G.M.T., and relatively to this B represents the same at 19h., and S that of the star. B and S are plotted from their differences of right ascension and declination from A. A circle described with S as centre and radius equal to the moon's semi-diameter, cuts the moon's path at D and E; these two points are positions of the moon's centre at the times of disappearance and reappearance respectively. Should this circle fail to cut the line of the moon's path, it shows that no occultation will take place. The moon passes over the distance A B in one hour, and if we assume its motion uniform, we have the time the moon takes to travel over $AD = \frac{AD}{AB} \times 60m.$ Measure the lengths of AD and AB on any scale convenient, and—

$$\text{Time AD} = \frac{27}{132} \times 60m.$$
$$13m.\ 17s.$$

So that the G.M.T. of disappearance is 18h. 13m. 17s., or, corrected for longitude, 10h. 43m. 17s. local time.

Similarly, $\frac{BE}{AB} = \frac{41}{122}$, and $\frac{41}{122} \times 60m. = 20m.\ 10s.$, so that G.M.T. of reappearance is 19h. 20m. 10s., or 11h. 50m. 17s. local time.

As regards the angles: if DF and EG be drawn vertically, or rather in the same direction as the differences in declination have been plotted, then the angles FDS and GES are the angles, from the north point of the moon's disc, of disappearance and reappearance respectively; if these be reckoned from the north towards the east, we have the former 4° and the latter 305°.

The most convenient way of drawing the figures is on what is known as logarithm paper, ruled with blue or red lines into squares. If these lines are drawn about a quarter of an inch apart, and each division is taken to represent one minute of arc, a figure can conveniently be drawn on half a sheet foolscap size.

After a very little practice, the calculations of hour angles, scaling off the parallaxes, and drawing the diagram can all be done in from a quarter of an hour to twenty minutes, and if done with only a moderate amount of care, the error of the time either of disappearance or reappearance arrived at should not exceed ten minutes. The mean error of a large number worked out by myself, or under my supervision, was 4·5m. The angles, however, should differ only a degree or two from the correct angles of ingress or egress respectively.

DATE—JANUARY 16, 1894. STAR, 9 TAURI.*

Lat. 20° 30′ S.; *approx. Long.* 112° 30′ W.

	h.	m.	s.
G.M.T. of conjunction	17	48	18
Sidereal time, G.M.N.	19	43	38
Correct for 17 hours	17	2	48
Sidereal time at Greenwich	12	46	26
Correct for longitude	7	30	0

* In the Nautical Almanac for 1896, a change has been made in the arrangement of the elements of occultations.

	h.	m.	s.
Sidereal time at place	5	16	26
Right ascension of moon	3	28	46
Hour angle at 17 hours G.M.T.	1	47	40
„ 18 „	2	45	0
„ 19 „	3	42	30

Moon's horiz. parallax ... 59′ 39″ Semi-diam. ... ... 16′ 16″

	Moon's right ascension. h. m. s.		Declination. ° ′ ″
18 hours	3 31 13	N.	22 33 29
Parallax	−1 45		+35 45
	3 29 28		23 9 14
19 hours	3 33 42	N.	22 44 18
Parallax	−3 22		+31 18
	3 30 20		23 15 36
Difference in time	52s.		
„ arc	13′ 0″		6′ 22″

	h.	m.	s.		°	′	″
Star's right ascension	3	30	44	Declination	22	51	47
Moon at 18 hours	3	29	28		23	9	14
Difference in time		1	16				
„ arc		19′	0″			17	27

THE MONTHLY RECORD.

THE SOCIETY.

Honour to the President.—The Fellows of the Society will be pleased to learn that the honour of Knight Commander of the Bath has been conferred by Her Majesty upon our President, Clements R. Markham, C.B., for his long and distinguished services to geography.

Royal Medals and other Awards for 1896.—The Royal Medals for this year for the encouragement of geographical science and discovery have been awarded as follows: The Founder's Medal to Sir William Macgregor, K.C.M.G., for his long-continued services to geography in British New Guinea, in exploring and mapping both the interior and coast-line, and giving information on the natives. The Patron's Medal to Mr. St. George R. Littledale, for his three important journeys in the Pamirs and Central Asia. The Murchison Grant has been awarded to Yusuf Sharif Khan Bahadur, Native Indian Surveyor, for his important work in Persian Baluchistan and elsewhere; the Gill Memorial to Mr. A. P. Low (of the Canadian Survey), for his five explorations in Labrador; the Back Grant to Mr. J. Burr Tyrrell (of the Canadian Survey), for his two expeditions in the Barren Grounds of North-East Canada; the

Cuthbert Peek Grant to Mr. Alfred Sharpe, for his journeys during several years in Central Africa. The following have been elected honorary corresponding members—M. P. de Semenoff, Vice-President of the Russian Geographical Society; Professor Dr. Karl von den Steinen, President of the Berlin Geographical Society; Professor Dr. G. Neumayer, Director of the Naval Observatory, Hamburg; Professor A. de Lapparent, late President of Council of the Paris Geographical Society; Dr. Albrecht Penck, Professor of Geography in Vienna University; Professor Dr. Otto Petterson, of Stockholm, the distinguished oceanographer; Professor Dr. Kan, President of the Dutch Geographical Society; Sr. D. Ernesto do Canto, of São Miguel, Azores, who has edited a series of the Archives of the Azores; Professor H. Pittier, Director of the National Physico-Geographical Institute of Costa Rica.

Legacy to the Society.—The late Mr. William Chandless, a gold medallist of the Society, whose death we regret to record, has left the Society a legacy of £500, free of duty.

EUROPE.

Glaciation and Lake-Basins of Subalpine Switzerland.—At a recent meeting of the Geological Society of London, a paper was read by Dr. C. S. du Riche Preller on 'The Pliocene Glaciation, Pre-Glacial Valleys, and Lake-Basins of Subalpine Switzerland.' The main object of this paper was to solve the problem whether the Pliocene glacio-fluviatile conglomerates of the Swiss lowlands were deposited on a plateau or in already existing valleys. For the purpose of this inquiry the author examined last summer a large number of additional glacial high- and low-level deposits throughout the Zürich valley over an area more than 40 miles in length; and his investigations led him to important conclusions with respect to the combination of causes which determined the formation of the lake-basins lying in the same zone at the foot of the Alps. The author contended that at the advent of the first glaciation the Zürich valley was already eroded. In his view the isolated high-level deposits were formed during the intermittent shrinkage of the upper Pliocene ice-sheet, while the low-level deposits were formed during the subsequent recession of individual glaciers left in the several valleys. He further adduced evidence that the Subalpine valleys of the Reuss, Aar, and Rhine were likewise excavated before the first glaciation. The author showed that the Lake of Zürich owes its origin, in the first instance, to a zonal subsidence (probably between the first and second glaciation) of about 1000 feet. During the second and third Ice-periods the original lake-basin was gradually filled with glacial and fluviatile deposits at both ends, and was finally restricted to its present dimensions by a post-Glacial bar deposited at its lower end by a tributary river. In the author's view the other subalpine lakes, extending from the Lake of Constance to Lac Bourget in Savoy, owe their origin and present limits, in the main, to the operation of similar causes.

Lake Peipus.—M. Venukoff gives in the *Comptes Rendus* of the Paris Academy of Sciences (vol. 122, p. 1078) a short account of the observations made by M. Spindler in Lake Peipus, a lake which overflows by the Narova river into the Gulf of Finland. Although the lake is nearly as large as that of Geneva, it is only 44 feet in depth, and its variation of level with the season is about 4½ feet. The water is very muddy, and the bottom is invisible at a depth of 7 feet. The lake

abounds with fish, the number of which seems to be increasing, although fishing is actively carried on.

ASIA.

Caucasian Travels of Dr. Abich.—Mr. Douglas W. Freshfield writes:—Dr. Abich was one of the German men of science who found employment and a field for scientific inquiry under the auspices of the intelligent administrators who fifty years ago directed the Caucasian government. A man of science more than a man of letters—in the technical sense of the phrase—he produced a mass of valuable technical treatises on Transcaucasian geology, but no popular or complete work. The voluminous correspondence now published consists almost entirely of family letters, ranging from the year 1842 down to 1874. But though addressed to his nearest relations, Dr. Abich's collected correspondence is in reality a diary of his wanderings and a notebook of his scientific observations and conclusions. Before 1850 Dr. Abich, in his capacity as an official, had been able to penetrate many of the mountain fastnesses at the foot of the great peaks which have lately become objects of attention to our countrymen. He realized the true character of the chain, and he describes in these letters, in simple but graphic terms, its characteristics. It is strange that he should have allowed these descriptions to remain buried for fifty years in an unpublished correspondence, while the best European works of reference were supplied with the most erroneous details as to the region in question. He evidently was equally without the phrasemaker's and the bookmaker's ambition. He seldom —and this will be the chief fault found by lovers of Nature with his letters—stops to depict a scene. He sums up the characteristics of Suanetia in a few appreciative sentences; but he brings back no particular landscape to our memory, and he certainly will suggest none to those who have not ventured into this region. Not to waste more space in analysis, Dr. Abich was in no sense an artist, but he was an observer, and what is much more, an original and independent thinker. His pages are interspersed with shrewd axioms and criticisms, as well as with clear statements of physical facts, and these are no sooner made than they are put to use as ethnological material for the explanation of the distribution and the characteristics of the various races that inhabit the mountains. Owing to its form, the valuable material scattered up and down this work is hard to piece together and use; the letters are a maze without a plan or an index; but they will repay perusal, and they must form an indispensable addition to the Caucasian shelf in every public library. They recall many stirring past episodes of warfare as well as the more commonplace mishaps of mountain traveller. There is no doubt that Dr. Abich, had he taken the trouble, might have produced a work on the Caucasus which, if it did not result, as he was led to believe on his visit to London in 1868 such a book might, in a profit of "several thousands of pounds," would have taken a high place among popular books of travel. It is satisfactory to find how completely in accordance Dr. Abich is in his observations and remarks with the English mountaineers who have succeeded him as explorers of the Caucasus.

The Brothers Grum Grjimailo's Journeys in East Tian Shan.*—We have before us one more volume of the admirable quarto series published by the Russian Geographical Society, and devoted to the reports of its expeditions to Central Asia. This last volume, edited with the same luxury as the preceding ones, is the first of a work in two volumes, which will contain the records of the journeys of the two brother explorers in West China, and it embodies their explorations in the Eastern Tian Shan. The expedition started in May, 1889. Its

* "Description of a Journey to West China," by G. E. Grum Grjimailo, with the aid of M. E. Grum Grjimailo. Vol. i. Along the Eastern Tian-Shan. St. Petersburg, 1896, 4to, 547 pages.

primary aim of exploring the southern slopes of the Pamirs had to be abandoned, and the Eastern Tian Shan, as well as the Nan Shan highlands, were taken instead. The party, consisting of the two brothers, accompanied by eleven cossacks, went first to Kulja, whence it proceeded north-east, across the Min Moral mountains to the Ebi Nor. These mountains suddenly fall on their northern slope from the height of the Tsyterty pass (8490 feet) to the low sandy depression, now occupied by the lake (700 feet). The party's aim was now to recross the Tian Shan, *i.e.* the Boro Khoro mountains, from north to south, and they went from one Taugut encampment to another, vainly asking for a guide. Finding none, they tried to find a passage themselves almost due south of Ebi Nor, but they had soon to abandon their intention. The valley they followed became a mere rent in the mountains, and the stream-bed, which they had to take to, was not only covered with immense blocks of rock, but was also soon inundated by volumes of water rushing from the snow-clad peaks. There are no proper river valleys in that part of the mountains, which form in the east of the Dos-Meghen a short chain of high snow-clad peaks. In their middle course the streams flow in cañons, which are cut through the diluvial deposits, and in their upper course they become mere rents in the rocks. As to the orography of the region, we are inclined to think, from the author's description, that the Khalyk-tau runs north-east, and that it meets with the Iryan-kharbut chain which runs north-west. The Boro Khoro, which evidently has the characters of a border ridge (p. 105), is thickly clothed, in a zone of from 6000 to 9000 feet, by fir-trees. Crossing now several northern spurs of the mountains and exploring every opening, the party made another series of attempts at crossing the main range in the south-south-west of Manas, but were finally compelled to take to the usual caravan route from Manas to Urumchi. Some reward was found, however, in an excursion from Urumchi to the Bogdo-ola lake and peak. The beauty of the scenery around the lake and at the foot of the mountain, which raises its three snow-clad summits to a height of over 12,000 feet, fully explains why the Mongols consider the Bogdo-ola as the seat of deity, and maintain that the lake covers the remains of 100,000 saints. The photographs of the chief mountain and the beautiful morainic lake, taken by M. Grum Grjimailo, and reproduced in the work, well illustrate the impression. From Urumchi the expedition went to Guchen, and therefrom made an incursion into the Jungaria desert, to the well Hashun, in order to secure specimens of the wild horse (*Equus Prjevalski*, Poljakoff) which Prjevalsky so passionately desired, but failed, to obtain. A small herd of seven horses was soon discovered as they came to drink at a small salt lake, but the difficulties of killing two of these most watchful animals, guided by one experienced sire, were very great. They were secured at last, and the fact that we have in Jungaria the real ancestor of our domestic horse is now fully established. Crossing the relatively low and narrow continuation of the eastern Tian Shan, the expedition went next to Hami, and to Turfan, and the pages given to the description of these two oases and their inhabitants will be found full of interest. They ought to be translated into English, as well as, in fact, nearly the whole of the work, which is written very pleasantly for the general reader. The importance of the Turfan oasis as a centre of commerce and administration is especially insisted upon. An important geographical discovery was made in the south of Turfan, when the expedition, exploring the relations between the Tian Shan and the highlands which lie further south, came across the sandy depression of the Assa, near Lukchun, and found that the bottom of this depression, situated between the Jarghoz (Eastern Tian Shan) and the Choltau mountains, lies 170 feet below the level of the ocean. The very low altitude of that bottom of an old lake has now been fully confirmed by two years' observations, made during Roborovsky's expedition. Turning from this depression

southwards, the expedition entered into the exploration of the mountains which may be considered as a link between the above and the highlands of the Nan Shan; but a full discussion of this connection being promised for the next volume, it may be as well to postpone until that time an analysis of the same. A comparison of the map which accompanies this volume with the old maps fully shows to what a considerable extent our knowledge of this part of Central Asia has been increased by the expedition. The map, which covers 4° of latitude (41° to 45°) and 10° of longitude (81° to 93°), is drawn on a scale of 27 miles to the inch, and contains many new and important details. Twenty-five photographs, some of which are most interesting, embellish the volume. Lists of birds (by M. Pleske) and of lepidoptera (by the author), which were brought in by the expedition, are added to this volume, while other collections, all very rich, are still in the hands of specialists.

A Journey from Damascus to Bagdad (*conclusion*).—The second and concluding part of Freiherr von Oppenheim's journey (see above, p. 548 of *Journal*) is contained in the fourth part of *Petermann's Mitteilungen*, 1896. The first part of this second section of the journey lay between the Euphrates and the Upper Tigris, a route which led him past many interesting remains of antiquity. He crossed the Euphrates at Der (Ed Deir) by a bridge connecting the town with an island in mid-stream, and then by a ferry connecting that island with the left bank. He then proceeded eastwards to Sauar on the Khabur, and ascended that river and its tributary, the Jaghjagh, to Nisíbin. The Khabur, a stream which, on account of the rapid fall in its bed and the large number of rapids, it would be difficult to render navigable, is bordered on both banks as high as Heseke (about 34 miles in a direct line from Sauar) by a succession of mounds, on the tops of which are numberless glazed and unglazed potsherds, showing the mounds to contain the buried remains of decayed villages. On the Jaghjagh, about 7 or 8 miles above its confluence with the Khabur at Heseke, v. Oppenheim found the ruins of an old bridge in the course of a road which he regards as identical with that marked on the Tabula Peutingeriana (Segmentum XI.) as leading from Ras el Ain to the Sinjar. Nisíbin, or Nesíbin, he describes as lying in a marshy situation, and subject to visitations of malignant fevers. At this place he was met by a body of retainers of Faris Pasha, Sheikh of the Shammar tribe, and conducted by them to the camp of their chief, to whom his expected arrival had been announced. The tribe over which this chief rules is the most powerful Beduin tribe in Mesopotamia, roaming over the whole of the upper part of that region from the Belich to the neighbourhood of Bagdad, and still holding the smaller nomadic tribes and numerous villages on the borders of the steppe in a kind of tributary relationship, though the Turkish Government has at last succeeded in enforcing on themselves the payment of taxes. Von Oppenheim's route eastward from Nisíbin passed a little to the north of two large mounds, Lelan and Tell Rarase, both said to conceal extensive ruins, and led him to two others not marked in any map, the Tell er Rumélan in 36° 36′ N., 42° 6′ E., and another a short distance to the east. Touching the Tigris at the frequented ford of Havi Zummar in 36° 46′ N., he remained on the right bank of the river and continued his journey, now in a south-easterly direction, towards Mosul, and about 50 miles north-west of that city, near the village of Abu Vajne, came upon the ruins of a hitherto unknown town of considerable size, which must date from the Arabs of the Middle Ages, and must have had a population of 20,000 to 30,000. The remains of this town are in part well preserved, beautiful gypsum columns of a ruined mosque speaking to its former prosperity. The ruins of Eski Mosul, which have the same character as those of Abu Vajne, were also visited. From Mosul, von Oppenheim descended the Tigris to the neighbourhood of Bagdad on one of the usual rafts supported by inflated goatskins. The whole journey on

such rafts seldom takes more than from six to eight days, while the land journey lasts about ten days. No other method of navigation is used on the Tigris above Bagdad. The highest point at which such rafts might be used on the Tigris is uncertain, but the actual limit at which their journeys begin is Diarbekr. The route is now regarded as tolerably safe, while formerly the rafts were frequently fired at, stopped, and plundered, especially by the Shammars. Von Oppenheim was, however, accompanied by an escort of zapties. There are bridges of boats across the Tigris at Jezire (Jeziret-ibn-Omar) and Mosul; the only others lower down are one at Samarra, one just above Bagdad, one at Bagdad itself, and one just below the city. The Turkish Government is now considering projects for the erection of an iron bridge across the river at Bagdad. Freiherr von Oppenheim's account of his journey is followed by an appendix, in which he gives an account of his mode of transcription of Arabic names (not followed in these notes), and an alphabetically arranged list of the places on his route in Roman and Arabic characters.

Phœnician Characters in Sumatra. Their Possible Connection with the Voyages of Nearchus.—In *Archæologia Oxoniensis* (1892–95, part 6) it is pointed out that the existence of characters of pure Phœnician type in Rejang, South Sumatra, described by Marsden in his history of that island, may possibly be due to a voyage of ships of Alexander the Great to those parts, of which written traditions also exist. After the successful voyage of Nearchus and Onesicritus—in ships built by Phœnician shipwrights—from the Indus to the mouth of the Tigris, and the narration by the former of his adventures to Alexander at Susa, a long interval elapsed, during which both captains disappear entirely from the scene. They are heard of again shortly before the death of Alexander, who, according to Plutarch (confirmed by Quintus Curtius), was met by Nearchus on his approach to Babylon, and during his fatal illness heard from him the history of his voyage on the ocean, from which, it is said, he had returned. Although Dean Vincent supposed this to refer to the coasting voyage, it is possible that a second voyage is alluded to, the inducement to which may have been supplied by an account of an Arab pilot, met with (as we know) by Nearchus on the coast of Gadrosia. The Rejang writing—specimens of which, from tablets preserved in the India Office Library, accompany the paper—was accepted as clearly Phœnician both by Professor Sayce and M. Renan, and more recently Dr. Neubauer has attributed it, from the shape of the letters, to the fourth or fifth century B.C. It presents marks of adaptation, which point to Greek influence such as might have been exerted during Nearchus' voyages, and reads, like the Greek of the period, from left to right, although in Sumatra generally, where the writing is Arabic, the reverse is the case. Traditions exist both in Java and Sumatra of the arrival of ships from the Persian Gulf in the time of Alexander, who is said "to have built a bridge across the sea," an expression which may refer to an intercourse established by his ships. Finally, it is worthy of remark that, while two of the characters are Cypriote forms found in inscriptions at Citium, the fleet on the Indus, according to Plutarch, numbered Cypriotes among its crews.

Friar Odoric's Island of Dondin.—A short note by M. Romanet du Caillaud, extracted with modifications from his forthcoming work on the origin of Christianity in the Annamite countries, is published in the *Comptes Rendus* of the Paris Geographical Society (1896, p. 117), on the subject of the identification of the Dondin island of Friar Odoric, which has always been a puzzle to commentators. The suggestion was thrown out by Sir H. Yule that the name might possibly be a misread contraction of "Isola D'Andiman" (the Andamans, with which M. Cordier also is inclined to connect the account), though he also notices that Marco Polo relates a story similar to Odoric's with reference to Dragoian (? in

Sumatra), and that the cannibalism mentioned by Odoric is ascribed by Gasparo-Balbi to the kingdom of the "Rey del Dagin," by which Achin is signified. M. du Caillaud thinks the name may be derived from the Annamite form of the Chinese term for the "Province of Luzon" (Lû'-Tông-Tinh), by which the Archipelago might well have been known to those arriving from China and Tongking. He refers to the traces of Christianity found by the Spaniards in the Philippines in the sixteenth century, and thinks that these may be ascribed to the teaching of the Franciscans of the missions founded by John of Montecorvino, especially Odoric. It may be remarked, however, that in Sir H. Yule's opinion ('Cathay,' p. 7) the missionary labours ascribed to the latter appear to be quite unsupported by evidence, no hint of such labours appearing in his travels. M. du Caillaud's explanation of the easterly direction taken in sailing from Dondin to China, seems also not quite satisfactory; but there is every indication of confusion in the sequence of this part of Odoric's narrative, as his description of Ceylon (immediately preceding that of Dondin) comes later than the accounts of Sumatra and Java.

AFRICA.

Mr. Scott-Elliot's Book on Mid-Africa.—In his recently-published account of his journey to Ruwenzori,* Mr. Scott-Elliot, besides giving fuller details respecting the country traversed than was possible in the paper read before the Society last year, devotes several chapters to a discussion of general questions connected with East and Central Africa, such as the climate in its relation to European settlement, the various floras of the country and their origin, the best method of opening up the British spheres, and so forth. In describing the various regions passed through, the author, as a botanist, naturally gives special attention to the vegetation and its conditions of growth. The peculiar character of the Mau forest, with its groups of slender stems resembling in growth the bamboo, with which it is associated, is ascribed to the action of the wind. Other features dwelt on are the papyrus swamps in the valleys of the Victoria Nyanza region; the bare, grassy hills of Karagwe and Ankole; the dry and monotonous plains of the neighbourhood of Lake Albert Edward; and the valleys and slopes of Ruwenzori, with their zones of vegetation. Like the other high mountains of East Africa, the highest peaks of Ruwenzori† are almost perpetually hidden from view by mist, which in the morning covers the lower slopes and appears to rise at the rate of about 1000 feet an hour. The upper limit of forest is given at 9000 feet, of bamboos at 11,000, while the heather-zone reaches to 15,500, at which the snow begins. The highest point is given as 16,700, which, considering the extent of the snow-fields revealed by photographs, certainly seems a surprisingly low estimate. The author lays stress on the importance of the central range of mountains‡ which he crossed before descending to the Tanganyika depression, and which he considers to stretch in a nearly continuous line along the eastern side of Tanganyika, rising to a height of 8000 to 10,000 feet. Not having seen von Götzen's map at the time of writing, he considered that the Mfumbiro peaks formed the northern termination of this range, which, where crossed, did not sink below 7700 feet. The plain at the head of Tanganyika appeared to contract suddenly at 30 or 40 miles from the lake, and it is possible that this is an indication of the position of a waterfall on the Rusizi, first mentioned by Livingstone, and marked on von Götzen's map. As regards climate, four zones of altitude are distinguished: (1) the coconut or oil-palm zone,

* A Naturalist in Mid-Africa. By G. F. Scott-Elliot. London: Innes, 1896.

† The correct spelling is said by Mr. Scott-Elliot to be Runsororo.

‡ Named by Baumann the Central African schistose range.

below 3000 feet; (2) the coffee zone, between this and 5000; the colony zone, from 5000 to 7000; and the cloud-belt, above 7000. In British East Africa, however, the first is subdivided into the wet coast jungle, and the dry region of scrub further inland. The shores of Tanganyika are considered very unhealthy, and the water of the lake dangerous to drink. Botanically, three main divisions only are laid down for all tropical Africa up to the Sahara, viz.: an eastern and western wet region (up to 3500 feet), and a fairly dry central ridge, the higher West African lands north of the Congo being not alluded to. The sudden change from the central to the western flora, on descending to Lake Tanganyika, is very striking. The Ruwenzori region is stated to be a more promising coffee (and tea) district than even the Shire highlands, apart from its present inaccessibility. Mr. Scott-Elliot, as is well known, strongly favours the adoption of the lakes route into the interior, even for parts of British East Africa. For colonies, the Masai uplands and the Stevenson Road plateau are the most recommended. A useful general map is given, showing the zones of altitude. As regards the special map, it is only fair to mention that, apart from corrections of one or two special features, it is really a copy of that published in the *Journal* last year.

Journey from the Niger Delta to the Benin River.—Through the courtesy of the Foreign Office we have been favoured with a copy of a report by Major Copland-Crawford, Vice-Consul at Warri on the western arm of the Niger Delta, on a journey made by him, in January last, from that station to Sapele on the Benin River. The latter place is at the junction of the two main arms of the Benin River (see *Journal*, vol. i. p. 123), and has lately been made the site of a Vice-Consulate. The object of the journey was to ascertain the nature of the country and people with a view to establishing a communication overland between Warri and Sapele. It proved, however, that owing to the amount of water in the rainy season, this route would be unsuitable for a road, but the journey was of use in establishing friendly relations with the people of the district. In order to avoid the head of Kaunusi's Creek a detour was first made to the east to Eferun and Tori, whence the direction was nearly due north. Before reaching Tori a marsh with 1 foot of water in the dry season, and probably 6 to 8 in the rains, had to be crossed. Beyond the town the country assumed the usual aspect of that inhabited by the Sobos, the path leading through bush or narrow belts of trees with cultivated plantations of cassava, yams, ground-nuts, etc., interspersed with oil-palms, on each side. Many dips with water and mud were met with, showing signs of a considerable amount of water in the rainy season. At a fairly large village named Abuga numbers of chiefs from the surrounding country were received, and friendship established. The inhabitants of most of the villages turned out to clear the road for the consul, but at Upay the people not only neglected to do so, but tried to hinder the efforts of the neighbouring villagers. The path about here was bad and beyond Upay ran through low swampy ground. At Adegi the chief, a blind but intelligent and friendly old man, expressed himself desirous of peace, trade, and the friendship of the white men. Other swamps and patches of damp rank bush were passed, some with considerable difficulty, and the path in places was narrow and overgrown, and obstructed by fallen trees, but cultivation was also seen, with oil-palms scattered about. On the second half of the route the country seemed generally lower than that previously passed through. The largest villages, Oquetolla and Odobrassa, had populations of 400 to 500 and 300 to 400 respectively. At the former the chief, Igbama by name, was of good presence and seemed to be a man of importance. He was well dressed in silk. Sapele was finally reached after a march of a little over two days, but if time had pressed it could have been reached sooner.

The New Road from Mombasa to the Victoria Nyanza.—At the end of January last Captain B. L. Sclater, R.E., F.R.G.S., who is in British East Africa as superintendent of communications under the orders of the Foreign Office, had advanced from the coast as far as Fort Smith, Kikuyu, where he had about sixty trained oxen in his two-wheeled carts. He had been lucky enough to get five of his ponies through the fly-district of the coast into the highlands, where they were doing well. From Kikuyu to the top of the Kedong escarpment—about 15 miles—was a tough bit, very broken and hilly and covered with dense forest or thick bush, which would take some time to get through. While this was in progress Captain Sclater was going on to Lake Naivasha to establish a station there. As regards this route generally, Captain Sclater reports the first 180 miles from the coast to be the most horribly dry and scrubby country he had ever seen, the little vegetation being all thorns and euphorbias, and the scanty population being in constant famine from want of water. On reaching the Kibwesi district there are permanent streams rising from under the lava-rocks, and the country improves a little, but is still covered with a dense thorny scrub. Between Kibwesi and Ukambani there are plains partly covered with thorny scrub and partly open grass, but the streams are all more or less salt. Here there are large herds of zebras and wildbeestes, and numerous rhinoceroses still to be met with. The hartebeest, probably *Bubalis cokei*, is plentiful, as are Thomson's and Grant's gazelles. Waterbucks are to be seen on the Kiboko, and a few herds of giraffes are met with. These plains extend far out towards Kilimanjaro, and are broken only by some volcanic-looking cones which stand out in that direction. No doubt the streams of lava came from that quarter also. Ukambani is a block of hills, perhaps 50 miles in length and 20 or 30 miles wide, surrounded by plains, and bordered on the east by the Athi river. It is an almost treeless country, and what trees there are are scrubby and thorny. Yet it is undoubtedly fertile, and well watered by numerous streams, all flowing into the Athi. The natives live for the most part on the tops of the hills, but grow large crops in their gardens in the valleys. They possess large herds of cattle, goats, and sheep, and plenty of fowls. The new road keeps along the western edge of the Ukambani hills. Between Ukambani and Kikuyu lie the Kapté or Athi plains. It had been hoped to carry the road straight across them, but it was found impracticable, the plains being broken up by swamps and covered in places by small blocks of lava. It was therefore found necessary to divert the road round to the east, skirting the Machako hills and crossing the two Athi rivers at the same places as the old caravan route. These plains were formerly the grazing grounds of the Kapté Masai, but the Masai having died of starvation and small-pox after the cattle-plague had carried off all their cattle, the plains have been re-occupied by vast herds of zebras and antelopes, varied by numerous rhinoceroses and ostriches. The soil of these plains, which are from 5000 to 5500 feet above the sea-level, does not appear to be very fertile, but grows excellent short grass. There are, however, many parts covered with loose blocks of lava, especially in the valleys and near the rivers. Kikuyu is on a broad ridge running south from Mount Kenia, and bounded on the west by the Kedong escarpment and on the east by the plains of the Athi and upper Tana. Kikuyu was apparently once covered with dense forest, which still remains all round the edge of the district, but of which the greater part of the centre has been cleared off by the natives for cultivation. Immense crops of potatoes and grain are grown, and there are numerous herds of goats kept and a few cattle. The climate, according to the testimony of the few Europeans who live there, is extremely healthy.

Explorations in the Barotse Country.—Captain Gibbons, who accompanied Mr. Reid and Captain Bertrand in the expedition to the Barotse country, of which a

short account was given in our April number, writes to us from the Nkala mission-station (S. lat. 15° 53′ 26″; E. long. 26° 4′ 00″), giving an account of his journeys after parting with his companions at Kazungula (*supra*, p. 427). During his voyage up the Zambesi to Lialui, he took numerous observations for latitude, and, with the help of a compass survey in addition, hopes to considerably improve the map of this part of the river. From Lialui he struck eastwards, and, after exploring the tributaries of the Lui, came upon a system—that of the Luena—apparently till then undiscovered.* The river is said to disappear in a lake near the Zambesi some 30 or 40 miles north of Lialui, draining subterraneously into the main river. From the source of a tributary of the Luena in 15° 43′ 9″ S. (altitude 3790 feet), Captain Gibbons went south and reached the Njoko at the junction of its two headstreams, the highest point at which there is permanent water at the end of the dry season. After returning to Penda-ma-tenka *viâ* the Njoko and Sesheke, the traveller again went north, exploring the Sejlefula and Majili systems. The station of Nkala, from which he wrote, was only some 8 miles from the Kafukwe, known there as the Loenje, but his intention of crossing this river and going north on its eastern side *en route* for the Luena was frustrated by floods. He therefore intended to go straight to the Luena, follow it up some 200 miles, and return along the watershed of its northern tributaries. All the rivers between the Lui and Sejlefula rise, according to Captain Gibbons, much further east than has been supposed. All these explorations appear to have been made independently of the other members of Mr. Reid's party, but the routes of Captain Gibbons must have crossed theirs at several points. We hope before long to receive a full report of the work accomplished, which will be read with much interest.

Organisms of Marine type in Lake Tanganyika.—In a paper describing the anatomy of a jelly-fish from Lake Tanganyika, reprinted from the *Quarterly Journal of Microscopical Science* (vol. 36, part 2), Mr. R. T. Günther makes some general remarks on the occurrence of such marine forms in fresh water, and its possible explanation by a change in the physical geography of the regions in which they occur. The number of Medusae inhabiting fresh water is very limited, and the occurrence of one in Lake Tanganyika is made more striking by its association with several genera of molluscs of decidedly marine type. Where such forms are found not far from the sea, as is the case in a lagoon in Trinidad, their presence can be explained by supposing a former connection between the existing fresh water and the sea, and an excess of rainfall over evaporation subsequent to their separation. An analogous explanation in the case of Lake Tanganyika would involve the supposition that the marine forms wandered in at a time when the region of the lakes was more than 2700 feet lower than at present, and the Atlantic extended over the present Congo basin with a fiord-like arm occupying the site of Tanganyika. The freshness of the lake-water at the present day would imply that the condition of overflow which now obtains must, on the whole, have been the rule since the separation of the basin. It will be remembered that Mr. Joseph Thomson gave a somewhat similar explanation of the development of the Tanganyika basin, attributing its formation, however, to a date subsequent to the separation of the Congo sea from the ocean (cf. *Proc. R.G.S.*, 1882, p. 627).

M. Foureau's Journey in the Erg south of Algeria.—Owing to the disturbed state of the Tuareg countries, M. Foureau has this season confined himself, at the request of the Governor-General of Algeria, to an excursion in the

* The name appears, however, in Livingstone's first map (drawn by Arrowsmith) both as a tributary of the Zambesi (Loena) entering in about 15° S. lat., and also (Ruena) as a small lake further north-east.

Erg region south of the Shotts, between Tuggurt and Ghadames, about half of the distance traversed being over new ground. As usual, he has executed a survey and taken photographs of the country. He was unable to discover the site of an ancient watering-place in the south of the Erg, of which he had heard, but acquired a knowledge of some interesting facts relating to the features of the country. From north to south six different zones, distinct in general aspect and in vegetation, can be distinguished, to which special names are applied. The two last consist of very difficult country, and contain regular mountains, now almost ingulfed in sand. Indications of an eastern arm of the Igharghar, the existence of which M. Foureau had before hinted at, were discovered towards the south of the Erg, along a line marked by high barometric pressure (*Comptes Rendus*, Paris Geographical Society, 1896, nos. 5, 6, 7).

GENERAL.

Awards of the Paris Geographical Society.—The various medals and other awards of the Paris Geographical Society have this year been given as follows: Gold medals have been assigned to Prince Henry of Orleans (journey in Indo-China), Captain Toutée (Niger), Commandant Decœur (Niger), MM. Chantre (work in the Caucasus), F. J. Clozel (explorations north of the Sanga), Auguste Pavie (who also obtains a money premium, for his explorations in Indo-China), Dr. L. Lapicque (journeys in the Persian Gulf, etc., and studies on the Negritos), and Commandant Decazes (surveys, etc., in French Congo). A special medal and premium is given for the Dictionary of Geography begun by M. de St. Martin and completed by M. Rousselet. Silver medals fall to MM. Renaud and de l'Isle, for surveys in the archipelago of Pai-tsi-long (Tongking); to M. de Saint-Arroman, for his work on the Geographical Missions of the Ministry of Public Instruction; to M. Gochet, for works connected with the teaching of geography; to M. F. A. Forel, the limnologist: and to M. Foureau, the Saharan explorer. The Jomard prize is awarded to M. Froidevaux, for his works on the history of geography.

The Geographical Association.—The committee was engaged last year in collecting the opinions of masters of Secondary Schools, including all the great public schools, as to the desirability of certain reforms in examinations in geography. A report on the results of this inquiry has been printed and circulated, and a short summary of it was given in the *Journal* for February (p. 208). The next step was to draw up a paper of suggested reforms, which was submitted to the Royal Geographical Society, the Royal Colonial Institute, the Education Committee of the Teachers' Guild of Great Britain and Ireland, the Royal Scottish Geographical Society, the Manchester Geographical Society, the Reader in Geography at Oxford, and the Lecturer on Geography at Owen's College, Manchester. Having received their sanction and approval, the suggestions were recast in the form of a memorial, and this has now been sent, with a covering letter, to the following boards of public examiners, conducting examinations that specially concern the secondary schools; viz. the Civil Service Commissioners, the Delegates for Local Examinations of the Universities of Oxford, Cambridge, and Edinburgh, the Oxford and Cambridge Schools Examination Board, the London University (Matriculation), the Victoria University (Preliminary), the College of Preceptors, the Scottish Education Department, and the Scottish Universities Preliminary Examination Joint Board. Omitting the introductory letter, the reforms advocated by the committee of the Geographical Association are as follows: 1. That the main principles of physical geography should form the basis of geographical teaching at all stages, and should be fully recognised in all examinations in geography. 2. That a general knowledge of geography, based on physical principles, should be required, together with a special study of some selected

region, *e.g.* India, a group of British Colonies, South America, Central Europe. 3. That it is desirable that all public examining bodies, such as the Civil Service Commissioners, the Universities (in their Local and Certificate Examinations, and London Matriculation), and the College of Preceptors, should recommend a course of instruction in accordance with the ideas suggested above. This would stimulate geographical teaching in schools, ensure that geography should be systematically taught throughout the school, and do away with the need for separate classes to prepare candidates specially for the various public examinations in geography. 4. That in the examinations above referred to geography and history should be dealt with in separate papers, and that the maximum of marks should be approximately the same for each.

Geographical Methods.—In the January number of the *Geographische Zeitschrift*, Professor Ludwig Neumann of Freiburg-i-B. has a valuable survey of the German literature dealing with the question of Geographical Methods. He divides his paper into two parts—(1) the method of orienting the subject itself, (2) the method to be adopted in teaching it at different stages of education. The question, "What is Geography?" seems to be asked in Germany as well as in this country, and Dr. Neumann quotes the ideas of several authorities who agree in the main with each other and with our own geographers in their definition of the scope of the science. Geography has two aspects, general and special. General geography (*Allgemeine Erdkunde*) deals with the "general laws of the distribution of every single category of phenomena on the Earth's surface." Special geography (*Länderkunde*) "describes and explains the various countries in their characteristic and distinguishing peculiarities of land and water forms, climate, vegetable covering, animal life, human settlements and their conditions of organisation and culture." The main divisions of general geography are classified as (1) Mathematical Geography, (2) Geophysics, (3) Geographical Morphology, (4) Oceanography, (5) Climatology, (6) Biological Geography, (7) Historical, or better, Anthropogeography. 3, 4, 5, are grouped as Physical geography, but it would be better to include 1 and 2 also under this heading. In the second part of his paper Professor Neumann reviews recent German works on Geographical Pedagogics. Germany is fortunate in this matter, for many of the leading geographers have had experience in school teaching, and therefore write with authority. Dr. Neumann insists on the importance of the teaching of geography by experts, and ridicules the absurdity of entrusting it to a teacher who "has not had a book of geography in his hand for eight or ten years, and who has no suspicion of its scope, methods, or teaching material," as is still sometimes done in Germany, and almost invariably in our own country. Every teacher of geography will find this an indispensable guide to the German literature on the teaching of the subject, which is too voluminous for each to read for himself.

Local Maps in American Schools.—Professor W. M. Davis has written an interesting little paper entitled "The State Map of Connecticut as an aid to the study of Geography in Grammar and High Schools," which is published as "Connecticut School Document, No. 6." The author gives very clear instructions for using the new 1-inch to the mile contoured map of the state, and while touching on the importance of scholars being trained to draw rough route-maps, he lays much greater stress on the results to be expected from being able to handle and understand the good maps provided by government. "The systematic use of the State Topographical Map in schools," he says, "would greatly promote the chief end of all geographical study; namely, a clear perception of the fundamental facts of earth-form in their relation to the occupation of the earth by man. . . . The teacher and student of geography should turn a larger share of their attention from

mere matters of location to the more important and interesting questions of the reasons for location, as determined by various classes of geographical controls, such as the forms of land and water, the relative positions of different forms, the products of the earth, which in turn are determined by soils, climate, etc., and the available sources of power, such as coal, waterfalls, and wind, which in turn influence manufactures, trade, and commerce." What Professor Davis says applies with equal force to the utilization of the 1-inch map of the United Kingdom in the schools of this country, as a manual of home geography, and an incentive to wider study.

OBITUARY.

Admiral Sir Robert O'Brien FitzRoy, K.C.B.

By Admiral Sir Anthony H. Hoskins, G.C.B.

By the death of Vice-Admiral Sir Robert O'Brien FitzRoy, K.C.B., this Society has lost a valued member, and the navy one of its most prominent officers. The son of a father distinguished alike by his professional and scientific attainments, he evinced the same remarkable qualities which induced the latter, when Flag-Lieut. to the Admiral on the south-east coast of America, to take up the command of the *Beagle*, vacant by the death of Captain Stokes, and to carry out under circumstances of the most arduous nature those surveying duties which eventually led him to such high honour and distinction in the service of the country. The subject of this notice worthily followed in his father's footsteps, and from the first moment of his entry into the navy gave promise of the career in which he achieved such high distinction, and which is now prematurely cut short. Having served with much credit in the war with China, '57 and '58, and obtained his promotion, on his return to England he qualified for Gunnery-Lieut., and being appointed to the *Edgar*, attracted the notice of Sir Geoffrey Hornby, then captain of the ship, and who from thenceforward became his firm and constant friend. Following that distinguished officer into the *Bristol*, on the west coast of Africa, he became the commander of that ship at an unusually early age, and subsequently served in the *Prince Consort* in the Mediterranean.

Promoted to Captain in February, 1872, he was in August of that year selected, notwithstanding his youth, by Sir Geoffrey Hornby as his Flag-Captain in the *Minotaur*, the Flag-Ship of the Channel Squadron, and on the termination of that command he was after a short interval again selected by Sir Geoffrey to be his Flag-Captain in the *Alexandra* in the Mediterranean, where he shared all the difficulties and responsibilities which devolved upon his chief during the Russo-Turkish war. On the paying off of the *Alexandra*, it may be said that his reputation was established as one of the most reliable and able captains in the navy, and consequently when the Egyptian war broke out in the summer of 1882 he was at once appointed to the command of the *Orion*, a vessel which from her construction and light draught of water was sure to occupy an important position in any operations in which the navy could take part after the bombardment of Alexandria.

On his arrival out, being pushed up at once to Ismailia, the key of the situation in the canal, he seized that place when the time for action came, and subsequently commanded the Naval Brigade which was landed to assist in carrying the works of Tel-el-Kebir. For these services he was made a C.B., and by them added greatly to the already high estimation in which he was held. With such qualities and such experience, it was almost as a matter of course that on the reconstitution of the

Training Squadron in 1885 he was appointed to be the Commodore in command, and subsequently as Commodore of the first class and Rear-Admiral Superintendent of the Naval Reserves he shared in all the important naval manœuvres which have done so much to instruct the officers and men of the Fleet, and develop naval strategy and tactics during recent years. Scarcely had he struck his flag as Admiral Superintendent of the Naval Reserves, when he was again summoned to active service in command of the Channel Squadron, but to the infinite regret of the whole service it before long became apparent that his health was failing him, and actuated by that high sense of duty which was ever his most prominent characteristic, as soon as he realized that such was the case he applied to be relieved in his command, which he relinquished in May of last year. He has not long survived the termination of his professional career afloat, and in him those who were associated with him lose a valued and well-tried friend, and the navy a bright example of chivalrous devotion to duty and of all those qualities which a naval commander should possess. Admiral FitzRoy joined the Society in 1874.

William Edward Oates.

Mr. W. E. Oates, who died of typhoid fever at Madeira on Good Friday, April 3, at the age of fifty-four, was an African sportsman and traveller, whose name was likewise associated with that of his brother, the late Mr. Frank Oates, in his researches into the natural history of South Africa. In 1873–4 these two brothers made a prolonged expedition into the country northward of the Transvaal, Frank Oates proceeding further than his brother into some of the wildest districts of Matabeleland, and beyond these to the Zambesi. On his return homewards from the Victoria falls, Mr. Frank Oates died of fever in the Tati district, on February 5, 1875, the scientific and other results of this expedition being subsequently published in a volume entitled 'Matabele Land and the Victoria Falls.' After this Mr. W. E. Oates made several further expeditions in South and East Africa, either alone or accompanied by friends; and it is to be regretted that no record of these travels and researches has been published further than in the form of occasional contributions from his pen to the periodical literature of the day, the *Times* and *Field* included. On one of these occasions, when on his way to India, he made an expedition with Mr. Holmwood, then vice-consul at Zanzibar, into the region of the Wami river, where the rich tropical vegetation and abundant animal life which characterize the district afford the naturalist ample opportunities for research. At a later period, starting from Mozambique in company with the lamented Captain Elton, then consul at that place, he proceeded to the Lurio river, the Bay of Pemba and Lake Kagavero, and finally to Ibo. In these regions, rich in their natural produce and the variety of their scenery, Mr. Oates obtained many remarkable natural history specimens, and was again successful—as he had previously been upon the Wami river—in his pursuit of the hippopotamus. But from a sportsman's point of view, perhaps the most notable of his expeditions was that which he made, in the autumn of 1876, into the portion of Zululand then known as John Dunn's country, and watered by the river Umvolusi. Here the amount of large game found at that time was something memorable, vast herds of koodoo, waterbuck, blue wildebeest, and zebra being constantly come across; so that, in the space of a few weeks, Mr. Oates obtained to his own gun a large number of these and other animals, including the inyala, pallah, reedbuck, and many of the lesser antelopes. Here, too, Mr. Oates shot a fine specimen of the now fast disappearing white rhinoceros, and procured many ornithological specimens of unusual interest. A number of the birds collected by Mr. W. E. Oates and his brother

were presented to the British Museum, but some of them were retained in Mr. Oates's own possession, and formed, along with the magnificent trophies of the chase he had obtained during his travels, a private collection of almost unique interest. Besides the expeditions above alluded to and others in South Africa, Mr. Oates had made a sporting journey into India, had visited America, and had passed a summer yachting in the northern seas, the furthest point reached (owing to the ice) being Green harbour in Spitzbergen.

Of recent years Mr. Oates's journeys had been of a less extended character, but his interest in matters relating to South Africa never lost its hold upon his mind, and since the formation of the society recently set on foot with a view to obtaining a government grant of land in the interior for the protection and preservation of some of the rarer animals now threatened with extinction in that country, Mr. Oates had served on its committee, an active and useful member. At the time of his death he was projecting another voyage with his eldest son to South Africa in a few months' time, and it was the same love of these haunts of his earlier years that took him in their direction last winter as far as Madeira, where his remains now rest in the beautiful Protestant burial-ground of that island. Mr. Oates was an excellent amateur artist, and had a considerable literary gift, which his modest estimate of his own achievements chiefly prevented him from exercising more fully than he did. Himself a Yorkshireman by birth and descent, and for several years an officer in the 2nd West York Militia, he had married, in 1877, a daughter of the late Mr. Joshua Buckton, of West Lea, Meanwood, near Leeds, by whom he leaves a family of four children; but a few years ago he purchased the estate of Gestingthorpe hall, Essex, where he had since resided, interesting himself actively in all matters affecting the welfare of that neighbourhood. Mr. Oates had been a Fellow of this Society for upwards of twenty years.

Alvan Millson.

We regret to record the death of Mr. Alvan Millson, M.A., Assistant Colonial Secretary for the Gold Coast, who died at sea near Sierra Leone, of fever, on April 18. He was thirty-five years of age. He was formerly a district magistrate in British Honduras, and was appointed district commissioner in Lagos in 1887, becoming Assistant Colonial Secretary two years later. He acted as special commissioner to the Yoruba country during the early part of 1890. Afterwards he held successively the posts of acting district commissioner eastern district, Acting Colonial Secretary and Deputy Governor, and then became chief Assistant Colonial Secretary for the Gold Coast Colony. He had been a Fellow of the Society for several years. In 1891 Mr. Millson contributed to the Society a valuable paper on his journeys in the Yoruba country (*Proc. R.G.S.*, 1891, p. 577).

CORRESPONDENCE.

Ancient and Mediæval Makran.

I VENTURE to submit the following remarks by way of friendly criticism and comment on some of the points dealt with by Colonel Holdich in his interesting paper published in the April number of the *Geographical Journal*. Though Makran lies so close to India, and a good half of it within what may be called our outer political border, much of it remains still unexplored, and many problems connected with its

ancient topography have yet to be solved. We ought, therefore, to be thankful to Colonel Holdich for affording us some light on these matters.

Colonel Holdich agrees with those who derive the name Makran from the Persian *Mahi Khuran*, the equivalent of *Ichthyophagoi*, and it may be said that the suggested etymology has no other equally probable to compete with it. Hamza of Ispahan laid it down that the name came from *Mah* = "moon," and *Karan* = "coast," the moon being supposed to exercise a favourable influence on the fertility of a country (see Meynard's 'Dict. de la Perse,' p. 538). This reads like a bad joke made at the expense of a province to which nature has been so unkind. The old Arab writers always called the province *Mukran*, but their authority for so doing is perhaps questionable. They sometimes wrote *Kunduhar* for *Kandahar*; they called those *Bulus* who call themselves *Baluch*; they turned *Jat* into *Zutt*, and ancient *Dewal* (in the Indus delta) into *Daybul*. In short, they had difficulties about foreign pronunciation, and also a terrible habit of copying previous writers without stopping to question about the right or the wrong.

It is a curious fact that the name Makran, which in the middle ages applied to all the vast tract between the sea and Sijistan, is now restricted to a comparatively narrow strip of country south of the plateau, bordered by the Kej valley and its prolongations east and west. North of this line the people appear to have a certain contempt for the name Makran, not probably because of its association with the old wretched "fish-eaters," of whom they have most likely never heard, nor yet because of the exceedingly "fishy" character of the coast population of the present day, but, rather owing to the fact that another name, viz. *Baluchistan*, has from various political accidents acquired a certain prestige and, so to say, pushed the older one to the wall. This strip of land along the coast was no doubt the country of the Ethiopians of Herodotus, of which people, says Colonel Holdich, no representative is now to be seen; yet that the "father of history" was right is the less difficult to believe now that the learned German, Dr. Glaser, seems fairly to have established his point that the original home of the *Habash* was in South-East Arabia, whence a body of them may very well have passed across the gulf of Oman to seek their fortunes in a land so similar in climate and physical conditions to that of their forefathers.

The ethnology of the province, indeed, offers many points of interest, and it is a subject which Colonel Holdich treats with predilection. The Ethiopians have vanished no one knows whither. In their old abodes we find another race, the *Med* (*Mayd* of the 'Ar. Geog.'), who in the middle ages were scattered along the Indus banks, and were very numerous in the arid tracts between that river and Guzerat. It is probable that descendants of these are to be found in the *Muhana* of modern Sindh, who are largely boatmen and fishermen, but it would seem that some cause or other led a great body of the tribe to migrate westward and settle on the Makran coast, where alone their name survives. Many of the race had always dwelt in the Indus delta, and devoted themselves to piracy. The Nagamara of Dewal, whose proceedings caused, or at all events furnished a pretext for, the Arab invasion of Sindh in 710 A.D., appear to have been a sub-tribe of the Med. Then there has been the spreading in Makran and the great eastward migrations of the Baluch tribes. These people, when we first hear of them in something more substantial than tradition, are found in various settlements between South-Eastern Karman and Panjgur in Eastern Makran. So far as is known to history, their earliest abodes appear to have been in the district south of Jiruft, in Karman, where they are described by El Mukaddasi as a nomad people living in hair-cloth tents, and as having for near neighbours another tribe who stood in awe of them. This was the people called *Kufs*, and also *Kuj* or *Koj*, who are often identified with the Baluch, but were actually

quite distinct from them, and claimed to be of Arab origin. They are said to have been the vilest set of savages. The Baluch themselves were evidently then the lawless and freebooting race we know them to be now when not controlled by a strong government, for we are told that 'Adudu'd-Daula, who was governor of Fars in the last quarter of the tenth century, harried them severely.*

Coming now to the ancient topography of Makran, Colonel Holdich is certainly right in identifying the *Kannasbur*, or perhaps *Fannazbur*, for which there seems to be better authority, with *Panjgur*. It is sometimes written *Fanajbur* and *Banajbur*, and as there is no *p* in Arabic, the latter name might represent an actual *Panajpur*. Then as regards the last syllable, the Baluch are given to turning the Persian *b* into *g*, and *gw*. Thus Persian *besh* becomes *gesh*, and *bazi* becomes *gwazi*. Another name which has undergone a similar change is the *Bih* of the Arab geographers, now known as *Geh*. The Punjgur of these writers was very ancient, and of Hindu foundation. The first mention of it, as Colonel Holdich shows, occurs in connection with an expedition made by the Brahman Prince of Sindh in the first half of the seventh century A.D., but Colonel Holdich makes a slight mistake when he says that the prince *built* the fort there; he only repaired what is described as an old and dilapidated fort, so that Panjgur may have been ancient even thirteen centuries ago. It is not unlikely that the Hindu name was *Panchapur* ("five towns or villages"), for the name might have applied then, as it has long done in later times, to a small group of settlements, one of which was larger than the rest and contained a fort. In 659 A.D. began the incursions of the Arabs into Makran and the present provinces of Jhalawan and Sarawan.† Their forces in this quarter seem to have been merely strong raiding-parties, and a main object with them was to establish themselves at some point as far east as possible whence they could issue to plunder Sindh. Such a point they found at *Kuzdar*, a name still extant, over 200 miles east of Panjgur. But they could hardly have gone so far eastward without first mastering Panjgur, and, at all events, this place must have been intended by Beladhuri when he wrote that Makran and its *capital* were conquered by an officer of the Khalifa Mu'awiya about 666 A.D., for centuries later Panjgur is described as the largest town in Makran, though Kej had then become the seat of government. It was certainly taken by Md. bin Kasim in 710 A.D., when on his way to the conquest of Sindh. It was, in fact, a place commercially and strategically important as a centre to which routes converged from Karman, perhaps Sistan, Kuzdar, Dewal in the Indus delta, and Tiz (now Tes), the great port of Makran. At that time the great East and West route through the province began at the ancient town of Fahraj (called by its inhabitants, says Y'aqubi, Fahra) in Narmashir, and passed through Panjgur to Kuzdar. It is curious that, of many places in Makran mentioned as lying on this route by Ibnu Khurdadhbeh—the only writer who refers to it—Panjgur is the only one now existing, or that can be identified with certainty. Colonel Holdich makes a little slip in saying that the Fahraj east of Bampur is in the "Karman district," for it is in the very centre of Makran; and his identification of the Fahraj, said to have been near Tubaran, with the Bampur Fahraj, is out of the question, as he would admit

* But it is fair to say that the Arab geographers describe the Baluch as harmless and inoffensive.

† That portion of Sarawan which lies between the Pishing and Quetta valleys on the north and Sohrab on the south was probably the *Kaykan*, *Kizkan*, etc., of Arab and later times. In a little work on the 'Indus Delta,' published two years ago, I made the mistake of putting Kaykan too far east, and bringing it into the present Kachhi country, whereas it lay immediately west of the latter. Jhalawan (excluding any portion of Makran) is the *Turan* of the Arab geographers.

himself on learning that the former was 130 farsakhs (at least 450, and perhaps over 500, miles), while Fahraj, east of Bampur, is only some 240 miles from Panjgur. It was the name of the first stage on this route from Fahraj, or Fahra, that led Idrisi into a lot of confusion. He read it *Tubaran*, and he confounded it with *Turan*, the name of the province immediately east of Makran, but the real name was *Tabaran*. The stage so called was 10 farsakhs (probably 40 miles) from Fahra, and it was "within the limits of Makran." It was, in fact, on or near the frontier, as we find from a subsequent remark of the author. Now, the description above given necessitates the location of Tabaran east or south-east of Fahra, and distant from it 40 miles, more or less. From his knowledge of the country, Colonel Holdich would at once see that in such a situation there never can have been a town "on the banks of a river which are cultivated and fertile," and Ibnu Khurdadhbeh says nothing about a river or cultivation. The place unconsciously referred to by Idrisi when he described Tubaran, was Kuzdar, for he followed Ibnu Haukal in the error of making a place called Turan (probably imaginary) his capital of the province of that name, while the other geographers say the capital was Kuzdar, and know nothing of a *town* called Turan. Thus Idrisi's description of his Tubaran was what he found recorded of the real capital Kuzdar. He flounders about indeed, in this part of his geography, in a ludicrous manner. Thus his *Fardan* is certainly due to a scribe's mis-writing of Kuzdar, both names looking very much alike in the Arabic character when points are omitted, as they frequently are. In the absence of these, it is quite impossible for any one unacquainted with the name intended to say whether *Q* or *F* is to be read, and in hurried writing *r* at the end of a word is often mistaken even by experts for *n*. Idrisi's *Kiz Kaian*, represented as in Central Makran, is the Kaykan or Kizkan which I have described as being part of the modern Sarawan province; and *Sura* was not in Makran, but a little north of Kalat, where, it is said, its ruins may yet be seen. The place appears in Ibnu Haukal's map. It must be remembered that Idrisi himself never was within thousands of miles of these regions, and that in compiling his work he had to depend chiefly on the older geographers, some of whom had indeed enjoyed the advantage of visiting the countries they described, but were, nevertheless, too often careless and inconsistent, while all were wanting in the critical faculty, and ready to copy anything from a previous writer. El Mukaddasi is the one least open to blame in this respect.

To enter into the consideration of Ibnu Khurdadhbeh's route at any length would occupy too much space; I shall only, therefore, notice one or two of the stages mentioned. It appears to me that Tabaran might be placed at Gehgan of Pottinger's route, which is rather more than 40 miles from Fahra, and on the border of Makran. The second march was a very long one of 14 farsakhs (56 miles), indicating a journey over a desert and waterless tract. Such would be the case in the stage from Gehgan to Basman, which, however, is more than 60 miles. Whether Basman is the modern representative of the *Basurjan* of the ninth century, which is the name of the second station in the route, I should not care to speculate. It would seem to be the place meant by Idrisi when he speaks of *Masurjan*. Ibnu Khurdadhbeh calls it the chief town of *Kharun*, a district which I am unable to identify. At this point I leave the route, and turn to some of the other ancient places mentioned by Colonel Holdich.

He suggests that the town of the *Khuruj*, or "Schismatics," called Rask (he prefers *Rasak*, I know not which is correct), was not the present place of that name, but probably occupied the position of the modern Sarbaz. To this he has been led by the consideration that Rask is a mere hamlet, without any appearance of ever having been anything better, while the ancient

Rask, he thinks, was a place of considerable celebrity, as the old writers invariably couple with the mention of its name the statement that "it is the town of the schismatics." But I cannot myself see in this statement anything to justify the conclusion he comes to. It is not said that Rask was a place of more than ordinary size, or that its inhabitants were remarkable in any respect more than other sectaries, but merely that it was a settlement of schismatics, a fact which would naturally attract the attention of an orthodox Musulman. It attracted Istakhri's attention; he noted it in his work, and others copied his statement. Then, if we refer to the itineraries the weight of evidence is against Colonel Holdich's suggestion. But here it is necessary to examine his location of the *Fahalfahra* of the geographers. He says "there is good reason for believing" that the present Bahu Kalat is on the site of Fahalfahra, but, in the absence of any statement of the reason, I venture to think it possible to produce good reasons for a very different identification. I believe that Fahalfahra is to be found in the *Fahraj* east of Bampur. As Fahraj of Narmashir was called Fahra by its inhabitants, there is nothing improbable in the suggestion that Fahraj of Makran may have been called Fahra too. Now, in two of the codices collated by Professor de Goeje, in preparing his critical edition of the text of Ibnu Haukal, he found the reading *Tal Fahra* instead of Fahalfahra, and I venture to think this reading is the correct one. It has, at all events, the advantage of being significant, for *Tall Fahra* * would mean "Fahra on the Mound," or "Mound of Fahra," and, as we know, mounds in the East are often evidence of the great antiquity of a site, being, in fact, composed of the *débris* of perhaps many successive fortresses or cities which have long since perished. Colonel Holdich is certainly right in considering that Fahraj of Makran, which appears to be also called *Puhra*, is the representative of *Pura*, the capital of Gedrasia in Alexander's time; but it must be admitted that the absence of ruins (if St. John is correct) is against his identification, as well as mine, which belongs to much later times. Has the neighbourhood, however, been thoroughly explored? Now, if we turn to the itineraries of the older geographers, and follow them on the map, we shall find that they proceed in a regular and intelligently arranged circuit. Thus, taking Istakhri's route, which was followed by the rest, the starting-point is Tiz, thence north-east to Kiz, and here it is to be observed that, if Fahalfahra had been on the site of Bahu Kalat, it would have been mentioned before Kiz, as it would have been the first place reached. Then from Kiz north-east to Panjgur, thence west to Dizak, south-west to Rask, north (as I contend) to Fahalfahra, south-west to Isfaka, south to Band, south to Bih (Geh), east to Kasrkand. Here the traveller is once more in the great Kej valley, and he proceeds with the route from Kej towards Sindh. It will be noticed that if, on leaving Rask, he had turned *south* to Bahu Kalat, the stage following that could not possibly have been to Isfaka, which, as the crow flies, is 110 miles distant, while the itinerary calls it two *short* stages—a discrepancy which naturally puzzles Colonel Holdich. But let us see how the itinerary tells in the circuit involved in my identification of Fahalfahra. The geographers say, "From Rask to Fahalfarah three days." † The actual distance in miles, according to Sir F. Goldsmid's route, from Rask to Fahraj, is 119. As an *estimative* day's journey—39 miles, or a trifle more—is nothing extraordinary in Eastern itineraries, then, Fahalfarah to Isfaka is two *short* stages. Fahraj to Isfaka is 45 miles, and $22\frac{1}{2}$ miles would constitute a short stage. Here, then, I think, is sufficient ground for placing Fahalfarah on or near the modern Fahraj, and Rask where the present village of that name is. Further support of these views may be

* The *tashdid* over the *l* in *Tal* does not appear in the manuscripts, as might be expected. The scribe would say, "Any fool knows that the *l* in *Tal* is *mushaddad*."

† Idrisi alone has two days.

found in the Arab geographers' maps. If Fahalfarah had been where Bahu Kalat is, it would have appeared in those curious maps as almost touching Tiz towards the north-east, but there it does not appear, and if the map at p. 32 of Elliot's first volume be examined, it will be seen that Fahalfarah is not in it, and evidently because there was no room for it above Isfaka. In Istakhri's map it is shown, and very far north.

Another location of Colonel Holdich's requires correction. He identifies the *Band* of the geographers with the present *Binth*, but this village is at least 60 miles from Isfaka, while the itinerary says the distance was one stage. He might point to the 119 miles between Kej and Panjgur, which the itinerary makes two stages, in justification of a 60-mile stage, but then the itinerary is clearly in error. The difference between 2 and 3 in the Arabic numerals is very slight, and 3, when rapidly written, may very easily be mistaken for 2.* The error here, then, is probably to be laid at the door of Istakhri's manuscript, which, as in too many other cases, has been servilely followed by the later geographers. *Band* is a word in common use in Makran for a ridge of hills. Such a ridge occurs at 20 miles or so south of Isfaka, *on the road to Geh*—the ancient *Bih*—and it is not unlikely that there was some halting-place in the pass over the hills named *Band*. From this place to Bih, or Geh, was another stage, the distance being 25 miles. The only objection that can be brought against my location of *Band* is the shortness of these two stages, while the itinerary does not say that they were short. It is, however, more natural to suppose a slight omission on the part of the geographer than to imagine his assigning only two stages to a distance of some 120 miles (Isfaka to Geh *viâ* Binth). Moreover, Binth lies far outside of the track, still existing, from Bampur to Tiz *viâ* Isfaka, which, if Colonel Holdich is right in believing that Tiz was once the port for the Sistan trade, was probably the route by which caravans passed from Fahraj of Narmashir to the coast of Makran.

Having occupied so much space with these criticisms, I must pass over other interesting questions of Makran topography dealt with by Colonel Holdich, to notice his identification of a place at the eastern end of the Makran-Sindh route. This is the town of *Khur*, which is mentioned by Idrisi, but by none of the earlier geographers. It is identified by Colonel Holdich with a place called *Khair*, on the Malir hill-torrent, near Karachi. Idrisi says that the road from Dewal to Makran passed through a small but populous town named Khur, but gives no further hint by which its position might be determined. I myself, however, feel confident that we have the key to its identification in its name. *Khur* is an Arabic word meaning "estuary" and "creek;" its equivalent in Sindhi is *Gharo*, or *Ghara*. Now, there is a village called *Gharo*, which, of course, had its name from its position at the head of the Gharo, or Khur, some 40 miles long, which is probably the remnant of the ancient *Sindhu Sagar* branch of the Indus, and also the channel by which Nearchus sailed down to the sea. Supposing *Dewal* to have been in the position I assign to it, or in any other equally consistent with such evidence as exists, this place Gharo must have been on the road from it to Makran. Arabs would naturally call it Khur. If it was founded, as it well may have been, by Arab seafaring traders, it must have been known as Khur before Sindhis called it Gharo. Both Arabic and Sindhi were spoken in Sindh in mediæval times, as the geographers inform us, and a large proportion of the Sindhi vocabulary at the present day is Arabic. This, as it seems to me, obvious identification, I regret to say, occurred

* In the Arabic the word "stage" appears in the dual (*marhaltan*), so that the author certainly meant "two stages," but the rough notes, or diary, written on the journey would probably have the distances expressed in numerals, and so the suggested mistake might occur.

to me only after the publication of my book on the 'Indus Delta,' a circumstance the more unfortunate that the discovery of Idrisi's Khur is all in favour of the views put forward therein as to the site of Dewal. I may mention, however, that since that little work appeared, I have come upon further evidence which points to a position for the old port some miles farther east than that fixed upon by me, but which cannot be discussed on the present occasion.

Colonel Holdich's location of the mediæval *Manhabari* (said to be two stages from Dewal, on the Makran route) at Pir Manga (vulg. Muggur Peer) is founded on a mistake. It was the Manhabari, or Manjabari, *on the Indus* that was "surrounded with gardens, fountains," etc. Nothing is said of the surroundings of the place on the Makran route, and there are some reasons for thinking that that route ran far to the north of Pir Manga.

It may be noted that *Yusli*, *Kirusi*, *Labi*, and some other names found in Idrisi's work and in the geographers' maps, are corruptions; also that the *Kalmati*, sometimes called the *Karmati*, who are found in South-Eastern Makran and Lower Sindh, are Baluch originally from Kalmat, on the Makran coast, and are in no way connected with the famous sectaries known as *Karmati* (or *Karamita*) in the ninth and tenth centuries A.D. On the collapse of the sect individual members of it fled no doubt in all directions, and especially to Sindh, the great refuge of the rebellious and the heterodox. If those fugitives have left behind them memorials indicative of artistic taste, it can only be said that they must have been men differing widely in type and tendencies from the older Karamita.

M. R. Haig, Major-General.

Postscript.—Since the above was written and despatched, it has occurred to me that I have perhaps been too hasty in saying that Colonel Holdich is in error in placing the eastern Fahraj in Karman, while it is, in fact, in the middle of Makran. I referred to the Makran of mediæval times, then, as we know, far more extensive than the modern province. But it may be that the Persian Baluchistan of to-day, which has absorbed so large a portion of old Makran, and includes the eastern Fahraj as well as a wide extent of territory between it and Kalati Baluchistan, is administered as subordinate to the government of Karman, and Colonel Holdich may have written in that sense. The latest maps, however, that I have seen, so far as they indicate an eastern limit of Karman, place it far to the west of Fahraj. It is at the same time fair to say that, on a further examination and comparison of the Arab writers, it appears to me not improbable that in their day the eastern Fahraj was an outlying dependency of Karman. Confusion on the subject has been occasioned by the fact of there being two places of this name, a circumstance of which Ibnu Khurdadhbeh, for instance, was apparently not aware, he having been only a compiler, and under the necessity of trusting to the reports of others. I cannot, however, ask for further space to deal with this question, which must be left to some other opportunity.

M. R. H.

The Anglo-Afghan Frontier Agreement.

In an article in the current number of the *Geographical Journal* (p. 547) exception is taken to a statement made recently by Lord George Hamilton in regard to the Bashgul and Arnawai valleys draining into the Kunar river. The statement in question arose out of a controversy about the Durand Agreement and the boundaries of Kafiristan. The *Geographical Journal* says, "It will be apparent . . . that Lord G. Hamilton's statement is not clear; in fact, it seems based on inaccurate topography. . . . Mr. McNair and Colonel Woodthorpe's information shows clearly that the Arnawai valley lies west, and not east, of the

Kunar river." It now appears that Lord G. Hamilton's statement was correct. In old maps the alternative name "Arnawai" is wrongly given to the Bashgul valley. It is a separate valley which lies east, not west, of the Kunar river.* The true facts of the case were made known by Sir George Robertson. He says, "The gallant McNair . . . never entered the real Kafir country at all; he only succeeded in reaching some of the Kalash villages of Chitral, which he mistook for the true Kafiristan" (*Geographical Journal*, Sept. 1894, p. 194).

STEPHEN WHEELER.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1895-1896.

Eleventh Ordinary Meeting, April 27, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

I may mention that it is the intention of the Royal Society of Canada to have a celebration of the fourth centenary of the discovery of North America by John Cabot, and, in writing to wish them all success in this laudable intention, I ventured to say—and I hope I was right—that my feeling would be shared by all the Fellows of this Society, with regard to the efforts of their fellow-subjects in Canada. We might have a celebration of John Cabot's discovery somewhat earlier in the year, say the time of his sailing from Bristol, in the early part of May, 1497; and we will not forget, next year, that splendid old navigator, Vasco da Gama, who sailed on March 25, 1497.

ELECTIONS.—*Charles Mylne Barker; Alexander Duncan Gordon; William Leathern; James Macredy, M.A.; Giovanni Pelleschi; Charles Salmon.*

The Papers read were:—

1. "Journeys in the Native Malay States." By Hugh Clifford, Esq.
2. "A Journey round Siam." By J. S. Black, Esq.

Twelfth Ordinary Meeting, May 11, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

ELECTIONS.—*George Thomas Baron; Robertson Fuller Bertram; Herman Bicknell; Major G. Cunningham; John Gordon Douglas; Captain Eustace Guinness, R.A.; Michel G. Holban; Captain Richard Abercrombie Irvine (Donegal Artillery); George Henry Judd; Captain S. L. Norris, R.E.; Commander Herbert Edward Purey-Cust, R.N.; Thomas Thynne, J.P.*

The Papers read were:—

1. "Through the Central Sudan to Sokoto." By William Wallace, Esq.
2. "Hausaland." By Rev. Chas. H. Robinson.

Thirteenth Ordinary Meeting, May 18, 1896.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

ELECTIONS.—*George Rourke Bryant; Lieut. E. H. Cator, R.E.; The Earl of Crewe; G. Beresford FitzGerald; Charles Paul Mackie; Captain E. J. Medley (17th Bengal Cavalry); Sir Montagu Frederick Ommanney, K.C.M.G.; Lieut. Gerald Christopher (1st Batt. Wilts Regiment); Henry B. Simonson; Charles Lindsay Temple.*

The Paper read was:

"Journey from Talifu to Assam." By H.R.H. Prince Henry of Orleans.

* 'Parliamentary Papers.' East India (north-west frontier, Bashgul valley), 1896.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Germany—Palatinate. *G.Z.* **2** (1896): 82–90. **Geistbeck.**

Die bayerische Pfalz. Ein geographisches Charakterbild. Von Dr. Alois Geistbeck.

Germany—Prussia. *Aus allen Weltteilen* **27** (1896): 196–202, 237–244. **Tetsner.**

Quer durch Preussisch-Litauen. Von Dr. F. Tetsner.

Germany—Riesengebirge. *Z. Ges. Erdk. Berlin* **31** (1896): 64–72. **Galle.**

Höhenbestimmungen mit Siedethermometern im Riesengebirge. Von Dr. A. Galle.

Germany—Silesia—Earthquakes. **Leonhard and Volz.**
Z. Ges. Erdk. Berlin **31** (1896): 1–21.

Das mittelschlesische Erdbeben vom 11 Juni 1895, und die Schlesischen Erdbeben. Von Dr. Richard Leonhard und Dr. Wilhelm Volz in Breslau. *With Map.*

Germany—Thuringia. *M.G. Ges.* (*für Thüringen*) *Jena* **14** (1895): 57–67. **Gerbing.**

Beiträge zur Ausrottung der Raubtiere im Thüringerwald (gothaischen Anteils). Von L. Gerbing.

Selections from documents on the destruction of beasts of prey in Thuringia.

Greece—Macronisi. *B.S.R. Belge G.* **20** (1896): 57–63. **Hauttecoeur.**

Le rocher de la Belle Hélène. Par Henry Hauttecoeur.

Iceland. *B.S.R. Belge G.* **20** (1896): 64–87. **Foulon.**

L'Islande. Par Maurice Foulon.

Account of a visit to Iceland in 1894.

Norway—Meteorology. **Mohn.**

Jahrbuch des Norwegischen Meteorologischen Instituts für 1892. Herausgegeben von Dr. H. Mohn. Christiania, 1894. Size 13½ × 10, pp. xiv. and 108.

Russia—Finland—Meteorology. ———

Observations publiées par l'Institut Météorologique Central de la Société des Sciences de Finlande. Volume Treizième: Helsingfors, 1895. Size 14 × 10, pp. viii. and 112.

Russia—Geology. **Nikitin.**

Bibliothèque Géologique de la Russie, 1894. Composée sous la redaction de S. Nikitin. Supplément au T. XIV. des Bulletins du Comité Géologique. St. Petersburg: Eggers & Co., 1895. Size 10 × 7, pp. viii. and 202. *Presented by the Geographical Committee of the Imp. Russian Geographical Society.*

Russia—Southern Lagoons. **Sokolow.**

Ueber die Entstehung der Limane Südrusslands. Von N. Sokolow. Mémoires du Comité Géologique, vol. x., No. 4. St. Petersburg: Eggers & Co., 1895. Size 13½ × 10, pp. vi. and 102. *Map.*

Russia—Wind. *B.A. Imp. Sci. St. Petersbourg* (5) **3** (1895): 59–67. **Kiersnowsky.**

La distribution du vent sur la surface de l'Empire Russe. Par J. Kiersnowsky.

Spain—Flora. *B.S.G. Madrid* **37** (1895): 337–386. **Lazaro e Ibiza.**

Regiones botánicas de la peninsula ibérica. Por D. Blas Lázaro é Ibiza. *With Map.*

Spain—Pyrenees—Railways. *B.S.G. Madrid* **37** (1895): 387–410. **Jiménez y Lluesma.**

Los ferro-carriles del Pirineo y la defensa nacional. Conferencia dada en la Sociedad Geográfica de Madrid el 6 de Noviembre de 1894. Por D. Eusebio Jiménez y Lluesma.

On the strategic importance of the railways of the Pyrenees.

United Kingdom—English History. **Temple.**

England's History as Pictured by Famous Painters. By A. G. Temple. Part I. London: G. Newnes [1896]. Size 11 × 14, pp. 20. *Illustrations. Price* 6*d. Presented by the Publisher.*

United Kingdom—Scotland—Climate. **Mossman.**

J. Scottish Meteorological S. (3) **10** (1896): 163–173.

The Frost of 1895 in Scotland. By R. C. Mossman. *With Maps.*

ASIA.

Baluchistan—Makran. **Holdich.**

Notes on Ancient and Mediæval Makran. By Colonel T. H. Holdich, C.B., etc. From the *Geographical Journal* for April, 1896. Size 10 × 6½, pp. 20. *Map.*

Central Asia. *Petermanns M.* **42** (1896): 33–41, 62–69. **Krahmer.**

Die Expedition der Kaiserl. Russischen Geographischen Gesellschaft in Mittelasien. Von Generalmajor z. D. Krahmer.

Central Asia—Climate. *Meteorologische Z.* **13** (1896): 49–61, 90–100. **Woeikof.**

Das Klima Centralasiens nach den Beobachtungen von Prschewalsky. Von A. Woeikof.

India—Assam. ——

Report on the Administration of the Province of Assam for the year 1894–95. Shillong, 1895. Size 13 × 8½, pp. xiv., 230 and clxxxii. *Map.*

India—Bombay Observations. ——

Magnetical and Meteorological Observations made at the Government Observatory, Bombay, in the year 1894, under the direction of Charles Chambers and Frederick Chambers. Bombay, 1895. Size 13½ × 10, pp. xvi., 16, and 12. *Presented by the Right Hon. the Governor in Council at Bombay.*

India—Burma. *Oesterr. Monats. f. d. Orient* **22** (1896): 23–26. ——

Der Aussatz in Birma.

India—Garhwal. *J.S. Arts* **44** (1896): 431–446. **Glass.**

The great landslip at Gohna, in Garhwal, and the measures adopted to prevent serious loss of life. By J. H. Glass. *With Plan, Section, and Illustration.*

India—Gujarát. *J. E. India Assoc.* **28** (1896): 17–24. **Rogers.**

The Province of Gujarát. By A. Rogers.

India—Gujarát. *Imp. and Asiatic Q. Rev.* (3) **1** (1896): 380–387. **Rogers.**

The Province of Gujarát. By A. Rogers.

India—Madras. ——

Report on the Administration of the Madras Presidency during the year 1894–95. Madras, 1895. Size 13½ × 8½, pp. xvi. (40), 216, and clxxxiv. *Maps and Diagrams.*

India—N.-W. Provinces and Oudh. ——

Report on the Administration of the N.-W. Provinces and Oudh for the year ending 31st March, 1895. Allahabad, 1896. Size 13½ × 8½, pp. iv., xxxiv., 224, iv., and 192.

India—Punjab—Sialkot District. **Smith.**

Gazetteer of the Sialkot District. By Captain J. R. Dunlop Smith. 1894–95. Revised Edition. Compiled and Published under the Authority of the Punjab Government. Lahore, 1895. Size 10 × 7, pp. ii., ix., 196, and lii. *Map.*

India—Wrecks and Casualties. **Street.**

Return of Wrecks and Casualties in Indian Waters for the year 1894. Prepared by H. A. Street, Commander R.I.M. Calcutta, 1895. Size 13½ × 8½, pp. 68. *Chart and Diagram.*

Japan. *Scottish G. Mag.* **12** (1896): 169–184. **Troup.**

The Industrial and Commercial Development of Japan. By James Troup, H.B.M. Consul at Yokohama.

Malay Archipelago—Celebes. *Z. Ges. Erdk. Berlin* **31** (1896): 21–49. **Sarasin.**

Reiseberichte aus Celebes. Von Paul und Fritz Sarasin. Vierter Bericht. *With Map.*

Palestine. **Clermont-Ganneau.**

Archæological Researches in Palestine during the years 1873–1874. By Charles Clermont-Ganneau, LL.D. Vol. ii. With numerous Illustrations from Drawings made on the spot by A. Lecomte du Moüy, Architect. Translated by John Macfarlane. Published for the Committee of the Palestine Exploration Fund, 1896. Size 11½ × 9, pp. x. and 504.

The second volume of this work is published before the first, which will be confined to the archæology of Jerusalem and its environs, while the volume now before us deals with the rest of Palestine.

Siam—Bangkok. **Ehlers.**

Aus allen Weltteilen **27** (1895): 89–100 (1896): 147–154, 181–192, 219–224.

Bangkok. Von Otto E. Ehlers. *With Illustrations.*

Straits Settlements. *Imp. and Asiatic Q. Rev.* (3) **1** (1896): 329–339. **Pickering.**

The Straits Settlements:—II. The Protected Malay States. By W. A. Pickering, C.M.G.

Syria—Historical Sites. *Mém. A.R. Sci. et Lettres Danemark* (6) **4** (1895): 59–92. **Østrup.**

Historisk-topografiske Bidrag til Kendskabet til den syriske ørken. Af J. Østrup. *With Map and Plans.*

Syria—Lebanon. **West.**

Palestine Exploration Fund, Quarterly Statement (1896): 165–168.

Barometrical Determination of Heights in Lebanon. By Professor R. H. West.

AFRICA.

Abyssinia. *B.S. Khédiv. G.* **4** S. (1895): 487–500. **Airaghi.**

Colonel C. Airaghi: Le Dembélas. *With Map and Plate.*

African Folklore. **Seidel.**

Geschichten und Lieder der Afrikaner. Ausgewählt und verdeutscht von A. Seidel. Berlin: Schall & Grund [1896]. Size 7½ × 5½, pp. xii. and 340. *Presented by the Publishers.*

A collection of quaint and interesting folk-tales and songs of the African peoples classified into those of people of Hamitic, Semitic, and Bantu speech.

African People. *Imp. and Asiatic Q. Rev.* (3) **1** (1896): 299–328. **Elsdale.**

The Problem of the Races in Africa. By Lieut.-Colonel H. Elsdale.

Algeria and Tunis—The Shotts. *Scottish G. Mag.* **12** (1896) 195–198. ———

The Shotts of Algeria and Tunis.

Angola. **Delannoy.**

B.S.R. Belge G. **19** (1895): 359–389, 459–500, 610–632; **20** (1896): 29–56.

L'Angola et la colonisation portugaise. Par Ch. Delannoy.

British Central and East Africa. *J.S. Arts* **44** (1896): 423–431. **Elliot.**

Commercial Prospects of British Central and East Africa. By G. F. Scott-Elliot.

German East Africa—Usukuma. *Aus allen Weltteilen* **27** (1896): 226–230. **Werther.**

Oberflächengestalt und Klima von Usukuma. Von C. Waldemar Werther. *With Illustrations.*

Madagascar. *Rev. Scientifique* (4) **5** (1896): 457–466. **Delisle.**
La colonisation à Madagascar. Par Dr. Fernand Delisle.

Madagascar. *M.G. Ges. (für Thüringen) Jena* **14** (1895): 1–47. **Kurze.**
Reisen norwegischer Missionare in Madagaskar. Von G. Kurze. I. Missionar Th. Selmers Reise durch das nördliche Tanalagebiet. II. Missionar P. Nilsen-Lunds Reise durch das mittlere Sakalavaland.

Somaliland—Bòttego's Expedition. *B.S.G. Italiana* (3) **9** (1896): 97. ——
Notizie della spedizione Bòttego.

St. Helena. *G.Z.* **2** (1896): 199–203. **Kobelt.**
Die zoogeographische Stellung der Insel St. Helena. Von Dr. W. Kobelt.

Tropical Africa. *J.R. Colonial I.* **27** (1896): 335–372. **Baden-Powell.**
The Development of Tropical Africa. By Sir George Baden-Powell, K.C.M.G., etc.

NORTH AMERICA.

American International Conference. ——
International American Conference. Reports and Recommendations, together with the Messages of the President and the Letters of the Secretary of State transmitting the same to Congress. Washington: Government Printing Office, 1890. Size 9½ × 6, pp. 216, 68, 14, 18, 2, 10, 4, 4, 30, 8, and 8. *Maps.*

Canada—St. Lawrence Valley. *American J. Sci.* (4) **1** (1896): 302–308. **Chalmers.**
Pleistocene Marine Shore-lines on the South Side of the St. Lawrence Valley. By Robert Chalmers, of the Geological Survey of Canada.

Canada—British Columbia. **Dawson.**
Part B. Annual Report, Vol. vii. Geological Survey of Canada, G. M. Dawson, Director. Report on the area of the Kamloops Map-Sheet, British Columbia. By George M. Dawson. Ottawa, 1896. Size 10 × 7, pp. 428. *Illustrations. Presented by Dr. G. M. Dawson.*

The Report deals first with the physical geography of the region under discussion, and then with the general geology, and in detail with the various geological formations, the boulder-clay and minerals of economic value.

Canada—Geological Survey Department. ——
Summary Report of the Geological Survey Department for the year 1895. Ottawa, 1896. Size 10 × 6½, pp. 154. *Price 10 cents.*

Canada—Tides. **Dawson.**
Survey of Tides and Currents in Canadian Waters. Report of Progress by W. Bell Dawson. Ottawa, 1896. Size 10 × 7, pp. 22.

Mexico—Lower California. *P. California A. Sci.* (2) **5** (1895): 733–775. **Eisen.**
Explorations in the Cape Region of Baja California in 1894, with references to former expeditions of the California Academy of Sciences. By Gustav Eisen.

United States. **Channing.**
The United States of America, 1765–1865. By Edward Channing, PH.D. Cambridge: the University Press, 1896. Size 8 × 5½, pp. viii. and 352. *Maps. Price 6s. Presented by the Cambridge University Press.*

This careful and interesting historical sketch is divided into ten chapters, respectively entitled, The Colonies, 1760–1765; Constitutional Opposition, 1760–1774; Revolution; the Constitution; the New Nation; Supremacy of the Jeffersonian Republicans, 1801–1809; the Second War of Independence and the Era of Good Feeling; Democracy; the Extension of Slavery, 1849–1861; the War for the Union, 1861–1865. There are five short appendices and three historical maps.

United States. **Riley.**
Johns Hopkins University Studies in Historical and Political Science. Fourteenth Series. III. Colonial Origins of New England Senates. By F. L. Riley. Baltimore, 1896. Size 10 × 6½, pp. 76.

United States—California—Fauna and Flora. **Behr.**
P. California A. Sci. (2) **5** (1895): 368–376.
Changes in Fauna and Flora of California. On the Power of Adaptation in Insects. By H. H. Behr.

United States—Lakes Erie and Ontario, etc.

No. 108—Part IV. Hydrographic Office. Sailing Directions for Lake Erie and Lake Ontario, St. Clair and Detroit Rivers, and Lake St. Clair. Washington: Government Printing Office, 1896. Size 9½ × 6, pp. vi. and 154. *Charts and Illustrations. Presented by the U.S. Hydrographic Office.*

United States—Public Lands. **Newell.**

Department of the Interior—U.S. Geological Survey, Charles D. Walcott, Director. The Public Lands and their Water Supply. By Frederick Haynes Newell. Extract from the Sixteenth Annual Report of the Survey, 1894-95. Part II.—Papers of an Economic character. Washington: Government Printing Office, 1895. Size 12 × 8, pp. [70]. *Maps and Illustrations. Presented by the Author.*

United States—Yellowstone National Park. **Chittenden.**

The Yellowstone National Park, Historical and Descriptive. Illustrated with Maps, Views and Portraits. By Hiram Martin Chittenden. Cincinnati: The Robert Clarke Co., 1895. Size 8 × 5½, pp. xvi. and 398. *Presented by the Publishers.*

The region of the Yellowstone Park, famous for its natural wonders, is here comprehensively described under the three heads, Historical, Descriptive, and the Future, followed by a series of appendices, one of which deals with the geographical names of the district. There are numerous illustrations and several rough sketch-maps.

CENTRAL AND SOUTH AMERICA.

American Republics.

Special Exposition Bulletin. How the Latin American Markets may be reached by the Manufacturers of the United States. Bulletin No. 63. Bureau of the American Republics, Washington, U.S.A. Size 8½ × 6, pp. x. and 506.

American Republics.

Manual de las Repúblicas Americanas. Oficina de las Repúblicas Americanas, Washington, 1891. Size 9 × 6, pp. 510. *Maps and Illustrations.*

Hand Book of the American Republics, 1893. Bureau of the American Republics, Washington City, U.S.A. Bulletin No. 50. January, 1893. Size 8½ × 6, pp. 604. *Maps and Illustrations.*

Bulletins of the Bureau of the American Republics. In six volumes. Vol. i. In Two Parts. Part i. Annual Report No. 1: Handbook No. 3; Breadstuffs (pp. 50, 604, and 92, maps and illustrations): Part ii. Mines and Mining Laws; Land and Immigration Laws; Commercial Information (pp. 348, 200, and 286). Vol. v. Tariffs. In Three Parts. Part i. Argentine Republic, Bolivia, Brazil, British Possessions (pp. xx., 202, 256, 140, and 54); Part iii. Peru, Salvador, Santo Domingo, United States, Uruguay, Venezuela (pp. 232, 40, 88, 62, 248, and 56). Vol. vi. Commercial Directories of the American Republics (pp. 456). Washington: Government Printing Office, 1893. Size 9 × 6.

Foreign Commerce of the American Republics and Colonies. Corrected to May 1, 1891. Bureau of the American Republics, Washington, U.S.A. Bulletin No. 6, May, 1891. Size 8½ × 6½, pp. 172. *Presented by the Bureau of American Republics.*

Argentine-Chilian Boundary. *Aus Allen Welttheilen* **27** (1896): 210-219. **Rohde.**

Ein Beitrag zum argentinisch-chilenischen Grenzstreit. Von Oberst Jorge J. Rohde. *With Map.*

Argentine Republic.

Bureau of the American Republics, Washington, U.S.A. Argentine Republic. Bulletin No 67. 1892. [Revised to February 1, 1894.] Size 8½ × 6, pp. 456. *Map and Illustrations.*

Bolivia.

Bureau of the American Republics, Washington, U.S.A. Bolivia. Bulletin No. 55. 1892. [Revised to July 1, 1893.] Size 8½ × 6, pp. 414. *Map and Illustrations. Presented by the Bureau of American Republics.*

An account of the present condition of Bolivia.

Chile and Patagonia. *Z. Ges. Erdk. Berlin* **31** (1896): 50-63. **Philippi.**

Bemerkungen über die orographische und geologische Verschiedenheit zwischen Patagonien und Chile. Von Dr. R. A. Philippi. *With Plate.*

The physical differences between Chile and Patagonia are of practical importance with regard to the present dispute as to whether the watershed or the line of highest

summits of the Cordillera is to be taken as the boundary between Chile and the Argentine Republic.

Colombia.

Bureau of the American Republics, Washington, D.C., U.S.A. Columbia. Bulletin No. 33. January, 1892. Size 8½ × 6, pp. 138. *Map and Illustrations.*

Costa Rica. **Calvo.**

Bureau of the American Republics, Washington, U.S.A. The Republic of Costa Rica. Some facts and figures, compiled and arranged by J. B. Calvo, 1893. Second edition. Followed by an article entitled 'Costa Rica at the World's Columbian Exposition at Chicago.' Special Bulletin, April, 1894. Washington, D.C. Size 9 × 6, pp. 56. *Map and Illustrations.*

Ecuador.

Bureau of the American Republics, Washington, U.S.A. Ecuador. Bulletin No. 64, 1892. [Revised to April 1, 1894.] Size 8½ × 6, pp. 178. *Map and Illustrations.*

Guatemala.

Bureau of the American Republics, Washington, D.C., U.S.A. Guatemala. Bulletin No. 32. January, 1892. Size 8½ × 6, pp. 192. *Map and Illustrations. Presented by the Bureau of American Republics.*

An account of Guatemala, largely dependent on official statements.

Haiti.

Bureau of the American Republics, Washington, U.S.A. Haiti. Bulletin No. 62. 1892. [Revised to September 1, 1893.] Size 8½ × 6, pp. 240. *Map and Illustrations.*

Honduras.

Bureau of the American Republics, Washington, U.S.A. Honduras. Bulletin No. 57, 1892. [Revised to March 1, 1894.] Size 8½ × 6, pp. 186. *Map and Illustrations. Presented by the Bureau of American Republics.*

This description of Honduras, which may be taken as a type of the monographs issued by the Bureau of American Republics, commences with a few pages of historical and geographical matter, and goes on to discuss political divisions, government, education, natural resources and finance, concluding with appendices concerning land and mining laws, tariff, and a commercial directory.

Jamaica.

Journal of the Institute of Jamaica. Volume i. (November, 1891—December, 1893.) Kingston, Jamaica, 1894. Size 10 × 7, pp. vi. and 392. *Portraits and Illustrations. Presented by the Institute of Jamaica.*

The publication of the Institute of Jamaica abounds in articles and notes descriptive of the island, and of the historical and scientific aspects of the West Indies in general.

Menendez' Travels in South America **Fonck.**

Viajes de Fray Francisco Menendez a la cordillera publicados a comentados por Francisco Fonck. Valparaiso: C. F. Niemeyer, 1896. Size 10 × 7, pp. xxviii. and 112. *Map. Presented by the Editor.*

A centennial edition of the description by the missionary Menendez of his travels in the Cordillera of Chile and the Argentine Republic.

Nicaragua.

Bureau of the American Republics, Washington, U.S.A. Nicaragua. Bulletin No. 51, 1892. [Revised to August 1, 1893.] Size 8½ × 6, pp. 184. *Map and Illustrations.*

Paraguay.

Bureau of the American Republics, Washington, U.S.A. Paraguay. Bulletin No. 54, 1892. [Revised to October 15, 1894.] Size 8½ × 6, pp. vi. and 146. *Map and Illustrations. Presented by the Bureau of American Republics.*

An account of the geographical, political, and economic conditions of Paraguay.

Salvador.

Bureau of the American Republics, Washington, U.S.A. Salvador. Bulletin No. 58, 1892. [Revised to March 1, 1894.] Size 8½ × 6, pp. 170. *Map and Illustrations.*

Santo Domingo. **West Indies.**

Bureau of the American Republics, Washington, U.S.A. Santo Domingo. Bulletin No. 52, 1892. [Revised to March 1, 1894.] Size 8½ × 6, pp. 202. *Map and Illustrations.*

Southern Andes. **Lista.**

Viaje á los Andes Australes. Por Ramón Lista. Articulo publicado en los "Anales de la Sociedad Cientifica Argentina." Tomo xli, páginas 5 y siguientes. Buenos Aires, 1895. Size 10 × 6½, pp. 88. *Maps and Illustrations. Presented by the Author.*

Uruguay. ——

Bureau of the American Republics, Washington, D.C., U.S.A. Uruguay. Bulletin No. 61. 1892. [Revised to September 1, 1893.] Size 8½ × 6, pp. 348. *Map and Illustrations.*

Venezuela. *Scottish G. Mag.* **12** (1896): 184–195. ——

Venezuela. Short Sketch of its History, Geography, and Industries.

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. **Gregory.**

The Geographical History of the Australian Continent during its successive phases of Geological Development. Inaugural Address [before the Australasian Association for the Advancement of Science] by the Hon. A. C. Gregory, C.M.G., President, Brisbane, Saturday, January 12, 1895. Size 9 × 5½, pp. 12. *Presented by the Author.*

Australian Handbook. **Gordon & Gotch.**

The Australian Handbook (incorporating New Zealand, Fiji, and New Guinea), Shippers' and Importers' Directory and Business Guide for 1896. London: Gordon & Gotch. Size 10 × 6½, pp. 632. *Maps, Plans, and Plates.*

Fiji Islands. *Ymer* **16** (1896): 27–46. **Stenberg.**

Bidrag till Kännedomen om Fidjiöarnes urgamla religion och forntida Kannibalism. Af Ernst G. Stenberg.

New Zealand. ——

New Zealand. Papers and Reports relating to Minerals and Mining. Wellington, 1895. Size 13½ × 8½, pp. 286, 64, 28, 16, 2, 4, and 28. *Maps, Plates, etc.*

Contains valuable reports on gold and coal mines, and on the geology of certain districts in New Zealand, illustrated by large-scale maps and the reproductions of very instructive photographs.

South Australia—Meteorology. **Todd.**

Meteorological Observations made at the Adelaide Observatory and other places in South Australia and the Northern Territory during the years 1891, 1892, 1893, under the direction of Sir Charles Todd. Adelaide, 1894–96. Size 13½ × 8½, pp. (1891) xiv., xviii., 42, and 122; (1892) xiv., xviii., 42, and 124; (1893) xiv., xx., 42, and 128. *Maps. Presented by Sir Charles Todd, Government Astronomer.*

Western Australia—Coolgardie Gold Fields. **Chewings.**

J.R. Colonial I. **27** (1896): 372–388.

Geological Notes on the Coolgardie Gold Fields. By Dr. Charles Chewings.

POLAR REGIONS.

Antarctic. *B.S.R. Belge G.* **20** (1896): 5–28. **Du Fief.**

La zone polaire australe et le projet d'une expédition antarctique belge. Par J. Du Fief. *With Map.*

This article gives some account of the projected Belgian Antarctic expedition.

Greenland—Scoresby Sound. **Ryder.**

Observations Météorologiques, Magnétiques et Hydrométriques de l'Ile de Danemark dans le Scoresby Sound, 1891–92, faites par l'Expédition Danoise sous la direction de M. C. Ryder. Publiées par l'Institut Météorologique de Danemark. Copenhagen: G.-E.-C. Gad, 1895. Size 14 × 9, pp. 6, 22, xlvi., 18, 6, xx., and 4. *Maps and Tables. Presented by the Danish Meteorological Institute.*

MATHEMATICAL GEOGRAPHY.

Geodesy. **Weiss and Schram.**

Publicationen für die Internationale Erdmessung. Astronomische Arbeiten des K. K. Gradmessungs-Bureau, ausgeführt unter der Leitung des Hofrathes Theodor

v. Oppolzer. Nach dessen Tode herausgegeben von Prof. Dr. Edmund Weiss und Dr. Robert Schram. VII. Band. Längenbestimmungen. Vienna: F. Tempsky, 1895. Size 12½ × 10, pp. 190.

This part gives the difference in longitude between Cracow and Lemberg as $16^m\ 20{\cdot}959^s \pm 0{\cdot}021^s$; that between Czernowitz and Vienna as $38^m\ 20{\cdot}239^s \pm 0{\cdot}012^s$; and that between Lemberg and Vienna as $30^m\ 49{\cdot}829^s \pm 0{\cdot}026^s$.

Map-reading. *Rev. Scientifique* (4 S.) **5** (1896): 385–394. **Lapparent.**

Association française pour l'avancement des sciences. L'art de lire des cartes géographiques. Par M. A. de Lapparent.

Rotation of Earth. *P.R.S.* **59** (1896): 185–189. **Hough.**

The Rotation of an Elastic Spheroid. By S. S. Hough. (Abstract.)

Discusses the periodic displacement of the pole of the Earth on the hypothesis of its elastic distortion. If the Earth were mathematically rigid the period would be 305 days, if only of the rigidity of steel 440 days, while actual observation gives a period of 427 days, confirming the latter estimate.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geology. *Tijds. K. Ned Aardrijks Genoots. Amsterdam* (2) **13** (1896): 1–24. **Cappelle.**

Bijdrage tot de Kennis van het Gemengde Diluvium. Door Dr. H. van Cappelle. *With Maps and Plate.*

Loess. *G.Z.* **2** (1896): 109–111. **Du Pasquier and Penck.**

Bemerkungen über das Alter und die Verbreitung des Lösses. Von Léon Du Pasquier und Albrecht Penck.

Meteorology. ——

Jahrbücher der K. K. Central-Anstalt für Meteorologie und Erdmagnetismus. Jahrgang 1893. Neue Folge XXX Band. Wien, 1896. Size 12½ × 9½, pp. xx., 116, 182, 44, and 16.

Meteorology—Rainfall and Forests. *Science N.S.* **3** (1896): 546–552. **Fulton.**

How Nature regulates the Rains. By R. L. Fulton.

Oceanography. **Buchan.**

Specific Gravities and Oceanic Circulation. By Alexander Buchan. *With Nine Maps.* From the *Trans. R. S. Edinburgh* **38** (1896): 317–342. *Presented by the Author.*

Dr. Buchan here re-states the data published in his Report in the Summary of Results of the Challenger expedition, taking account of the density of ocean water *in situ*, and thence deducing the circulation of water throughout the mass of the ocean.

Oceanography—Bay of Biscay. *Rev. Maritime et Colon.* **128** (1896): 448–460. **Kergrohen.**

Mission Scientifique du "Caudan" dans le golfe de Gascogne. Par M. de Kergrohen. *With Map, etc.*

Physical Geography. **Timmerman.**

Tijds. K. Ned. Aardrijks. Genoots. Amsterdam (2) **13** (1896): 25–58.

Het tegenwoordige standpunt der Physische Geographie. Door J. Æ. C. A. Timmerman.

Plant-Geography. *G.Z.* **2** (1896): 90–94. **Schimper.**

Die gegenwärtigen Aufgaben der Pflanzengeographie. Von A. F. W. Schimper.

ANTHROPO-GEOGRAPHY AND HISTORY.

Commercial Geography. *G.Z.* **2** (1896): 95–106. **Oppel.**

Übersichten der Wirtschaftsgeographie. Wirtschaftsgeographische Begriffe und Zahlenwerte. Von A. Oppel, in Bremen.

Historical—Cosa's Map. *B.S.G. Madrid* **37** (1895): 473–480. **Navas.**

Juan de la Cosa y su Mapa-Mundi. Por el Conde de las Navas. (Summary.)

Historical—Dortsman's Voyage. ——

Bijd. Taal-, Land- en Volkenk. Ned.-Indië (6) **2** (1896): 246–279.

Documenten betreffende de ontdekkingstochten van Adriaan Dortsman beoosten en bezuiden Banda, op last van Antonio Van Diemen en Cornelis Van der Lijn ondernomen in 1645 en 1646; medegedeeld door Mr. J. E. Heeres.

Historical—Masudi. *J. Asiatique* (9) 7 (1896): 133–144. **Vaux.**
Note sur un ouvrage attribué à Maçoudi. Par M. le baron Carra de Vaux.

Historical—Mendaña's Voyage. *B.S.G. Madrid* 37 (1895): 411–426. **Duro.**
Relación breve de lo sucedido en el viaje que hizo Alvaro de Mendaña en la demanda de la Nueva Guinea, la cual ya estaba descubierta por Iñigo Ortiz de Retes, que fué con Villalobos de la tierra de Nueva España el año de 1544. Por D. Cesáreo Fernández Duro (1567 á 1569).

BIOGRAPHY.

Capitaine. *Rev. G.* (1896): 241–255. **Drapeyron.**
Les Capitaine, gardiens du dépôt de l'observatoire et collaborateurs de Cassini pour la carte générale de la France. Par L. Drapeyron. *With Portrait.*

Pedro II. of Brazil. ———
Homenagem do Instituto Historico e Geographico Brazileiro á Memoria de sua Magestade o Senhor D. Pedro II. Rio de Janeiro, 1894. Size 9½ × 6½, pp. cxliv. and 804. *Portrait. Presented by the Brazilian Institute of History and Geography.*
A collection of press notices and various references to the last Emperor of Brazil.

Sinclair. *J.R. Agricultural S.* (3) 7 (1896): 1–21. **Sinclair.**
Sir John Sinclair, Founder and President of the First Board of Agriculture. By the Ven. Archdeacon Sinclair, D.D. *With Portrait.*

Tasman. **Walker.**
Abel Janszoon Tasman: his Life and Voyages. Read before the Royal Society of Tasmania, November 25, 1895. By James Backhouse Walker. Hobart, 1896. Size 8½ × 6, pp. vi. and 56. *Maps.*

GENERAL.

Educational Maps. *G.Z.* 2 (1896): 203–209. **Hözel.**
Wert und Verwendung der Spezialkärtchen in unseren Schulatlanten. Von Dr. E. Hözel. *With Maps.*

Gazetteer. **Rousselet.**
Nouveau Dictionnaire de Géographie Universelle. . . . ouvrage commencé par M. Vivien de Saint-Martin, et continué par Louis Rousselet. Supplément, 1er Fascicule, AA — Algarve; 2e Fascicule, Algarve — Appingadam; 3e Fascicule, Appingadam—Balkans. Paris: Hachette & Co., 1895–96. Size 13½ × 10.
The commencement of a new supplement to this well-known gazetteer.

Gazetteer. **Penzler.**
Ritters geographisch-statistisches Lexikon über die Erdteile, Länder, Meere, Buchten, Häfen, Seeen, Flüsse, Inslen, Gebirge, Staaten, etc. Achte . . . Auflage. Unter der Redaktion von Johs. Penzler. Erster Band. A—K. Leipzig: Otto Wigand, 1895. Size 11 × 7½, pp. vi. and 1064.
This is an extremely compact yet comprehensive Gazetteer, including the whole world.

General Geography. **Heiderich.**
Die Erde. Eine allgemeine Erd- und Länderkunde. Von Dr. Franz Heiderich. Vienna, etc. A. Hartleben, 1896. Size 9 × 7, pp. xiv. and 876. *Maps, Plans, and Illustrations. Price 20 mark. Presented by the Publisher.*

Geographical Exhibition. *M.G. Ges. Hamburg* 11 (1896): 29–40. **Michow.**
Die Geographische Ausstellung auf dem internationalen Geographen-Kongress in London, 1895. Von H. Michow.

Geographical Method. *Science* (N.S.) 3 (1896): 1–13. **Gilbert.**
The Origin of Hypothesis, illustrated by the Discussion of a Topographic Problem. By G. K. Gilbert. *With Plates.*

Geographical Names. *G.Z.* 2 (1896): 158–163. **Egli.**
Die Seele der geographischen Namen. Von J. J. Egli.

Historical—British Empire. **Lord.**

The Lost Possessions of England. Essays in Imperial History. By Walter Frewen Lord. London: R. Bentley & Son, 1896. Size 8 × 5½, pp. x. and 326. *Price* 6*s*.

An account of the circumstances in which Dunkirk, Tangier, Minorca, Cuba, Manila, Corsica, Buenos Ayres and Montevideo, Java, and the Ionian Isles were relinquished after having been British possessions.

International American Conference. ———

International American Conference. Reports of Committees and Discussions thereon. 4 vols. Vol. iii., Excursion Appendix. Narrative of the Tour of the Delegates through the United States; together with descriptions of places visited, and Reports of Addresses delivered. Vol. iv., Historical Appendix. The Congress of 1826, at Panama, and subsequent movements towards a Conference of American Nations. Washington, 1890. Size 12 × 9½, pp. (vols. i. and ii.) 1204; (vol. iii.) 344; (vol. iv.) 376.

Mediterranean Winter Resorts. **Reynolds-Ball.**

Mediterranean Winter Resorts. A Practical Handbook to the principal Health and Pleasure Resorts on the Shores of the Mediterranean. With special articles on the Principal Invalid Stations by Resident English Physicians. By Eustace A. Reynolds-Ball. With a map of the Mediterranean, and several Diagrams. Third Edition. London: Paul and Co., 1896. Size 7 × 4½, pp. xii. and 411. *Price* 5*s*. *Presented by the Publishers.*

The data concerning the innumerable health resorts in the countries bordering on the Mediterranean—both European and African—appear to have been compiled with much care, and should prove useful to many people "in search of a climate."

Patent Laws. **Wise.**

Gleanings from Patent Laws of all Countries, with information as to points of practice, area, population, productions, etc. By W. Lloyd Wise. First Portion: Argentine Republic—Germany. (Twenty-two Countries.) London: Cassell & Co., 1895. Size 7½ × 4½, pp. 208. *Price* 2*s*. *Presented by the Author.*

Philology. **Muller.**

Beiträge zur Lehre der Wortzusammensetzung im Griechischen, mit Excursen über Wortzusammenstellung im Indo-germanischen, und in verschiedenen anderen Sprachfamilien. Von Dr. H. C. Muller. Leiden: A. W. Sijthoff, 1896. Size 9½ × 6½, pp. 60. *Presented by the Publishers.*

Proposed Description of British Islands. **Mill.**

Proposed Geographical Description of the British Islands based on the Ordnance Survey. By Hugh Robert Mill, D.Sc. From the *Geographical Journal* for April, 1896. Size 10½ × 6½, pp. 22.

Routes from Copenhagen. *G. Tidskrift* **13**, 1895-96 (1896): 93-99. **Madsen.**

Om Betydningen af Landenes geografiske Forhold for deres Magtomraade. Af Oberst Emil Madsen. *With Map.*

The paper is illustrated by an isochronic distance map of Europe, showing the time required to reach the various parts of the continent from Copenhagen.

Scientific Classification. *American Naturalist* **30** (1896): 101-112. **Cope.**

The Formulation of the Natural Sciences. By E. D. Cope.

Although mainly referring to Natural History, the systems of classification dealt with may also prove useful in Geography.

Submarine Cables. *National G. Mag.* **7** (1896): 102-107. **Herrle.**

The Submarine Cables of the World. By Gustave Herrle. *With Chart.*

The Madagascar and Mauritius cables are not shown on this chart.

Sixth International Geographical Congress. **Paulitschke.**

Der sechste internationale geographische Congress zu London (26 Juli bis 3 August 1895). Von Philipp Paulitschke. Size 9 × 6, pp. [34]. *Presented by the Author.*

Theory of the State. **Smith.**

The Theory of the State. By George H. Smith, of Los Angeles, California.—Proc.

American Philosophical Soc., vol. xxxiv., July, 1895, No. 148. Philadelphia: MacCalla & Co. Size 9 × 6, pp. [162.]

Travels. **Brehm.**

From North Pole to Equator, Studies of Wild Life and Scenes in many lands. By the Naturalist-Traveller, Alfred Edmund Brehm. Translated from the German by Margaret R. Thomson, edited by J. Arthur Thomson. London: Blackie & Son, 1896. Size 10 × 7, p. 592. *Illustrations.* *Price* 21*s.* *Presented by the Publishers.*

This will be specially noticed.

Tsetse Fly-Disease. *Nature* **53** (1896): 566–568. **Blandford.**

The Tsetse Fly-Disease. (*Illustrated.*) By Walter F. H. Blandford.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Publications issued since April 7, 1896.

1-inch—General Maps:—

ENGLAND AND WALES:—219, 220, 252, 286, 303, 307 (revision), engraved in outline; 242, 254, 287, 316, 317, 318, 319, 320, hills engraved in black or brown, 1*s.* each.

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ENGLAND AND WALES:—**Newcastle, Gateshead and Environs** (revised), 9, 46, 56, 71, 78, 108, 113, 127, 2*s.* 6*d.* each. **Tynemouth, North and South Shields** (revised), 12, 13, 19, 20, 21, 23, 28, 29, 34, 36, 39, 40, 44, 51, 54, 55, 60, 61, 66, 67, 70, 71, 2*s.* 6*d.* each. **Wallsend, Jarrow and Environs**, 9, 10, 11, 12, 13, 14, 19, 20, 21, 28, 29, 30, 31, 37, 38, 39, 40, 42, 43, 44, 45, 46, 2*s.* 6*d.* each.

——— 5-feet scale:—

London—Re-survey, VIII. 98; XII. 6; XV. 76, 85, 94; XVII. 6, 2*s.* 6*d.* each. (*E. Stanford, Agent.*)

Germany. **Lepsius.**

Geologische Karte des Deutschen Reichs, auf grund der unter Dr. C. Vogels Redaktion in Justus Perthes' Geograph. Anstalt ausgeführten Karte in 27 Blättern in 1: 500,000 or 7·9 stat. miles to an inch. Bearbeitet von Dr. Richard Lepsius, o. ö. Professor an der Technischen Hochschule und Direktor der Geologischen Landesanstalt in Darmstadt. Lieferung VII., Blatt 13, Hannover; Blatt 14, Berlin. Lieferung VIII., Blatt 6, Emden; Blatt 7, Hamburg. Gotha: Justus Perthes, 1896. *Price* 3*s. each part.*

ASIA.

China. **Bretschneider.**

Map of China and the surrounding Regions. Compiled from the latest information by E. Bretschneider. To illustrate the author's "History of Botanical Discoveries in China," 1896. Scale 1 : 4,500,000 or 71 stat. miles to an inch. Engraved and printed by A. Iliin, St. Petersburg. 4 *sheets.* *Presented by the Author.*

This is a general Map of China, on which many of the routes followed by travellers are laid down. The importance of towns is indicated by symbols and the type in which their names are printed. A full explanation of the symbols employed is given, as well as of some of the Chinese geographical terms.

The map is clearly drawn, but the boundary between Burma and China is not correctly laid down.

Syria—Mesopotamia, etc. **v. Oppenhein.**

Routenkarte einer Reise von Damaskus nach Baṛdād ausgeführt im Jahre 1893, von Dr. Max Freiherrn von Oppenhein. Scale 1 : 1,200,000 or 18·9 stat. miles to an inch. Petermann's 'Geographische Mitteilungen,' Jahrgang, 1896, Tafel 5. Gotha : Justus Perthes, 1896. *Presented by the Publisher.*

AFRICA.

Angola. **Commissão de Cartographia, Lisbon.**

Provincia de Angola. Carta dos Districtos de Benguella e Mossamedes, 1895. Scale 1 : 1,000,000 or 15·9 stat. miles to an inch. Commissão de Cartographia, Lisbon. 4 *sheets.* *Presented by the Commissão de Cartographia, Lisbon.*

From the list of explorers given whose routes are laid down on this map, it would appear that the best authorities have been consulted in its construction. It is printed in colours, the hills in brown, water blue, and explorers' routes in red. The heights are indicated in figures, and ordinary trade routes by black lines. The capitals of districts, mission stations, military posts, etc., are shown. The map appears to have been carefully compiled, and all the latest material used.

German East Africa. **Krauss.**

Spezialkarte von Deutsch-Ostafrika. Entworfen und bearbeitet von P. Krauss. Berlin, W., 1896. Simon Schropp'sche Landkarten-Handlung. Scale 1 : 2,000,000 or 31·6 stat. miles to an inch. *Presented by the Author.*

Mozambique. **Commissão de Cartographia, Lisbon.**

Reconhecimento hydrographico da Barra do Rio Licungo (M'Gondo). Lat. 17° 37·5′ Sul., Long. 37° 22·5′ E. Green. Scale 1 : 10,000 or 6·3 stat. miles to an inch. Levantado em Julho de 1893 por J. Affreixo, 1° ten^te^ da armada. Commissão de Cartographia, Lisbon, 1895. *Presented by the Commissão de Cartographia, Lisbon.*

Portuguese South-East Africa. **Noronha.**

Esboço da Carta do Districto de Lourenço Marques. Dedicada ao Sr. Capitão Tenente da Armada João do Canto e Castro da Silva Antunes. Concluida sob a patrocinio do Sr. Engenheiro hidrographo Ernesto de Vasconcellos. Por Eduardo de Noronha. Tenente de infanteria. Scale 1 : 250,000 or 3·9 stat. miles to an inch. 3 *Sheets.* *Presented by J. Batalha-Reis, Esq.*

The names of the numerous explorers from whose surveys this map has been compiled are mentioned underneath the title. The soundings round the coast are laid down, and insets of Lourenço, Marques, and Villa do Rossano Garcia are given.

Sudan. **Istituto Cartografico Italiano.**

Carta del Teatro della guerra nel Sudan Egiziano tratta dalle migliori e più recenti carte militari inglesi per cura dell' Istituto Cartografico Italiano. Scale 1 : 2,000,000 or 31·7 stat. miles to an inch. E. Voghera, editore. Roma, 1896. *Price* 1 *li.* *Presented by the Istituto Cartografico Italiano, Rome.*

Transvaal. **Troye.**

Troye's Map of the Transvaal or S.A. Republic. Scale 1 : 500,000 or 7·9 stat. miles to an inch. Engraved by Wurster, Randegger & Co. (J. Schlumpf), Winterthur. Published for Messrs. Fehr and Du Bois, Pretoria, S.A.R. Sole Proprietors of copyright. London : E. Stanford. Revised edition, 1896. *Presented by E. Stanford, Esq.*

This is the second edition of a map which was noticed at some length in the *Geographical Journal* for February, 1893. The railway between Natal and Johannesburg is not shown. So far as possible, the boundaries of landed property have been laid down, with their names; but, owing to want of reliable information, the map is in this respect somewhat incomplete. On the north-west corner there is an inset of South Africa, drawn on one-tenth of the scale of the principal map.

Transvaal. **Smulders.**

Kaart van de Zuid Afrikaansche Republiek (Transvaal). Scale 1 : 1,500,000 or 23·6 stat. miles to an inch. Uitgave J. Smulders & Co., den Haag. Januari 1896.

AUSTRALIA.

Coolgardie Goldfields. **Vogan.**

Map of the Coolgardie Goldfields, compiled and drawn by Arthur J. Vogan, from original observations, and those of R. Brazier, Carnigie, D. Lindsay, and others. Scale 1 : 633,600 or 10 stat. miles to an inch. George Robertson and Co., Publishers, Melbourne, Sydney, Adelaide, Brisbane, and London, 1896. *Presented by the Author.*

Persons who are interested in the Western Australian goldfields will find this a useful map. The location of the several mining claims are indicated and numbered, but there is nothing on the map to show what these numbers refer to. The positions of condensers, places where good water and camel-feed are to be found are indicated, as are also some of the geological features.

PACIFIC OCEAN.

Pacific Ocean. **Deutsche Seewarte.**

Stiller Ozean. Ein Atlas von 31 Karten, die physikalischen verhältnisse und die Verkehrsstrassen darstellend, mit einer erläuternden Einleitung und als Beilage zum Segelhandbuch für den Stiller Ozean. Herausgegeben von der Direktion. Hamburg: L. Friederichsen and Co., 1896. *Presented by Dr. G. Neumayer.*

This is the last of a series of physical atlases of the oceans issued by the German Admiralty, and which have been compiled under the direction of Dr. Neumayer. It is to be supplemented by a volume of explanatory text, which will be published during the present year. The material from which this atlas has been compiled has been mainly drawn from the records of German sailors, but where necessary, those of other nations have been employed. The atlas contains thirty-one charts, showing the depths, currents, temperatures, winds, magnetic elements, and rainfall. In the explanatory notes preceding the charts, the authorities consulted are given, as well as a general description of the charts. The construction of these charts must have entailed a vast amount of work, and they will doubtless prove of great service to seamen navigating the Pacific Ocean, and to all students of physical geography.

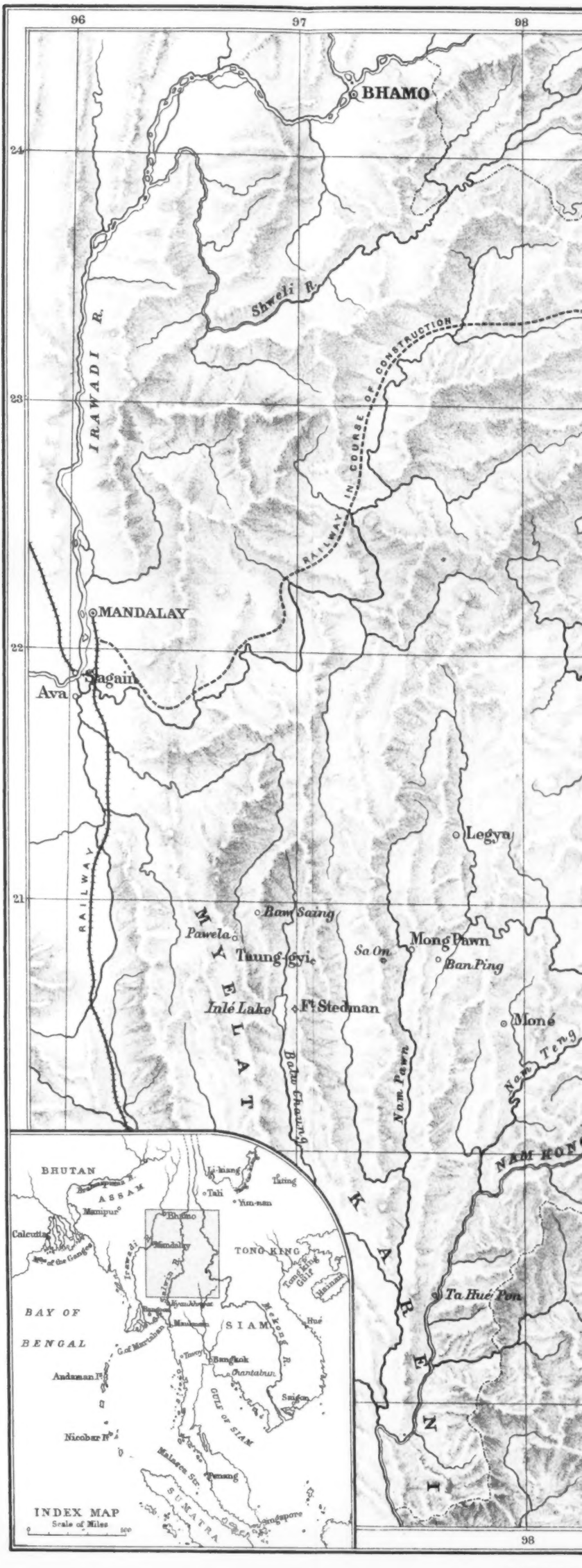
PHOTOGRAPHS.

St. Helena. **Swinton.**

Thirteen photographs of the Island of St. Helena, taken by Colonel A. Swinton, R.A. *Presented by Colonel A. Swinton, R.A.*

This is an interesting series of photographs illustrating the scenery of the Island of St. Helena. Among them are views of Longwood, Napoleon's tomb, Lemon Valley, Sandy Bay, Old Woman's Valley, together with several photographs of natives and their dwellings.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.



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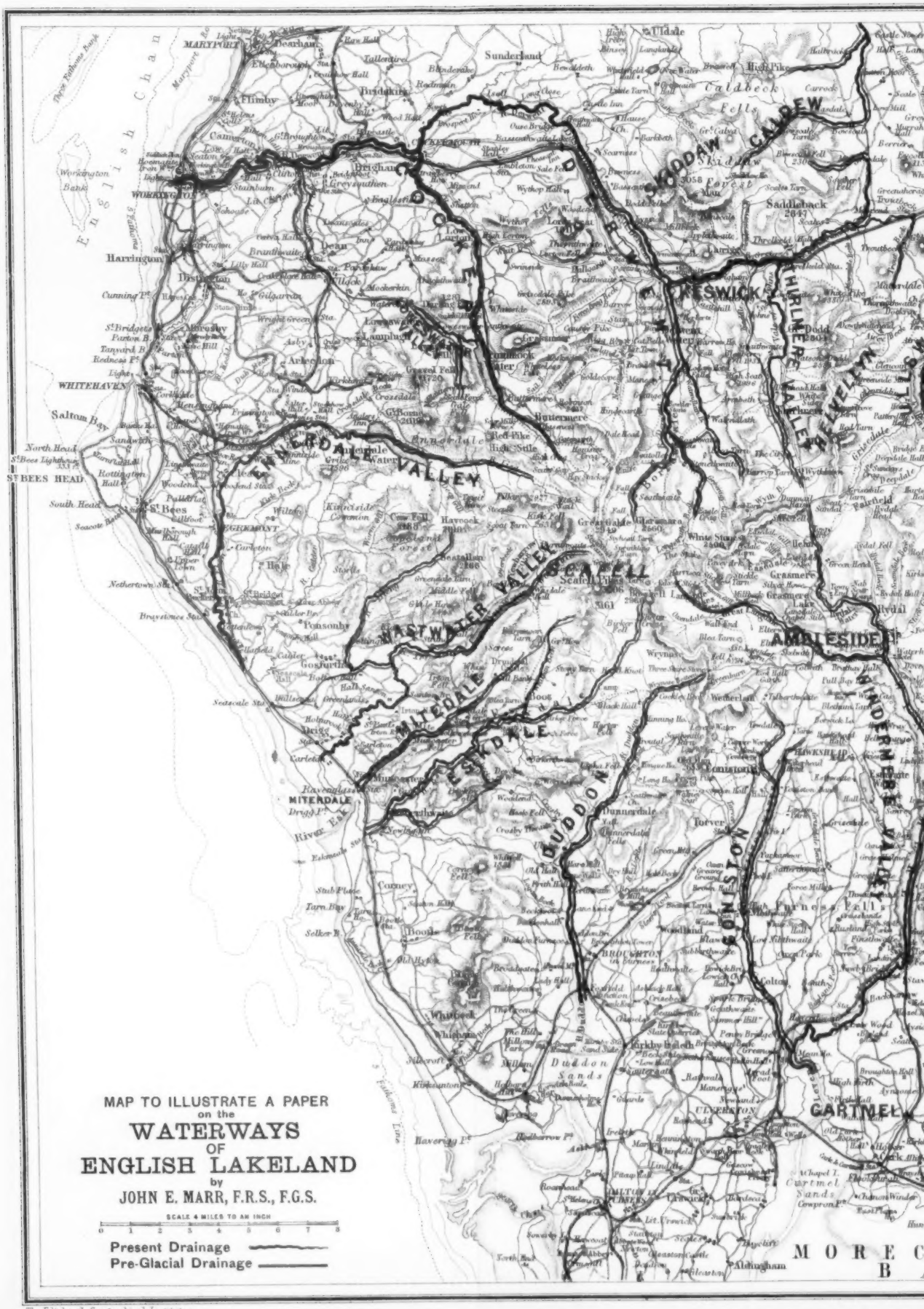

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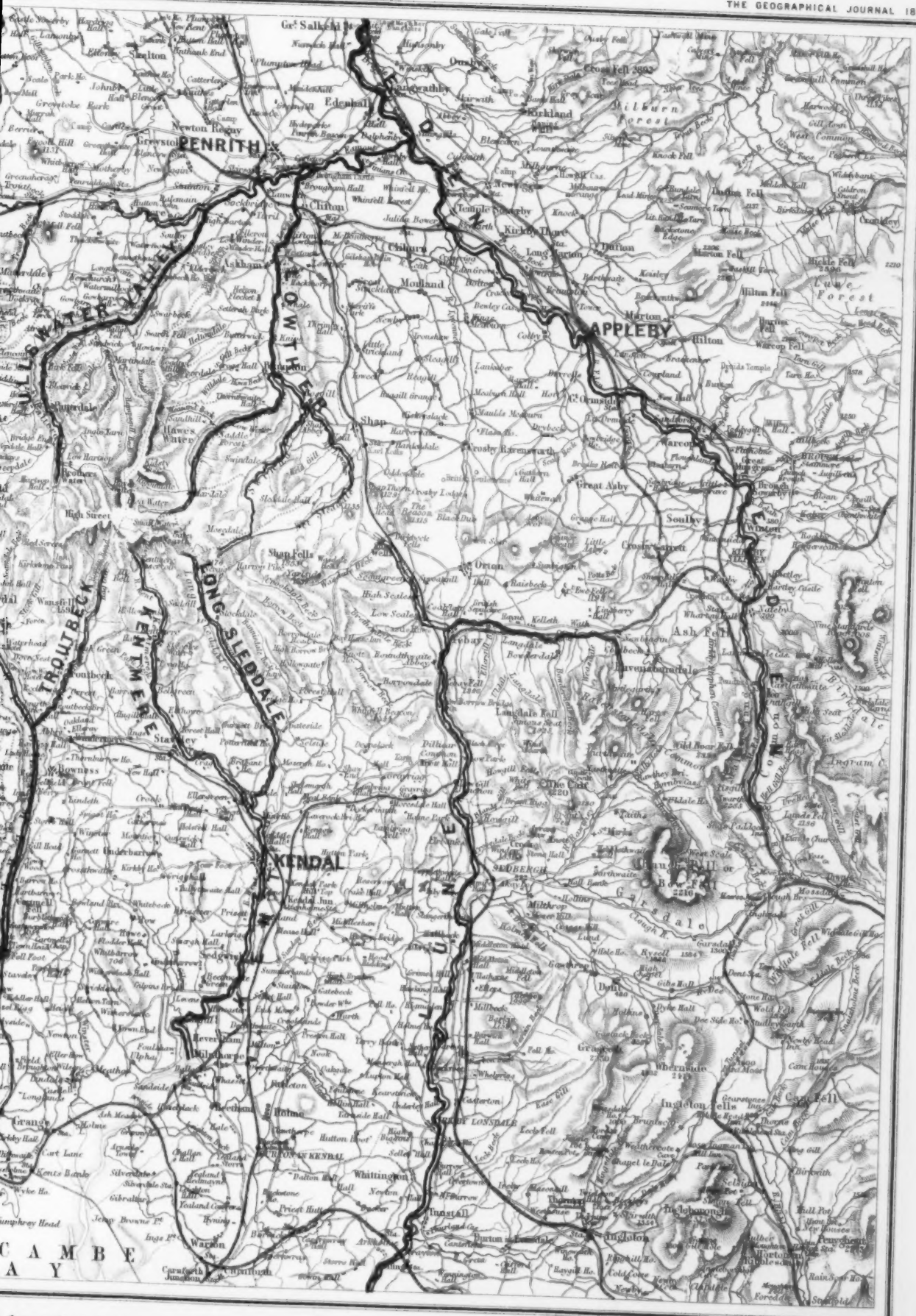
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Crosby Garrett
Ash Fell
Lunds Fell
Wild Boar Fell
Whernside
Ingleton Fells
Casterton
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Garsdale
Ullswater
Haweswater
Thirlmere
Derwent
Windermere
Troutbeck
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Mallerstang
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Lune
Rawthey
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Clough R.
Grayrigg Forest
Crosby Ravensworth
Bowderdale
Langdale
Mosedale
Garsdale
Dentdale
Newton Rigg
Edenhall
Clifton
Temple Sowerby
Kirkby Thore
Long Marton
Dufton
Warcop
Hilton
Maulds Meaburn
Crosby Ravensworth
Tebay
Raisbeck
Kelleth
Newbiggin
Stainmore
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Mallerstang
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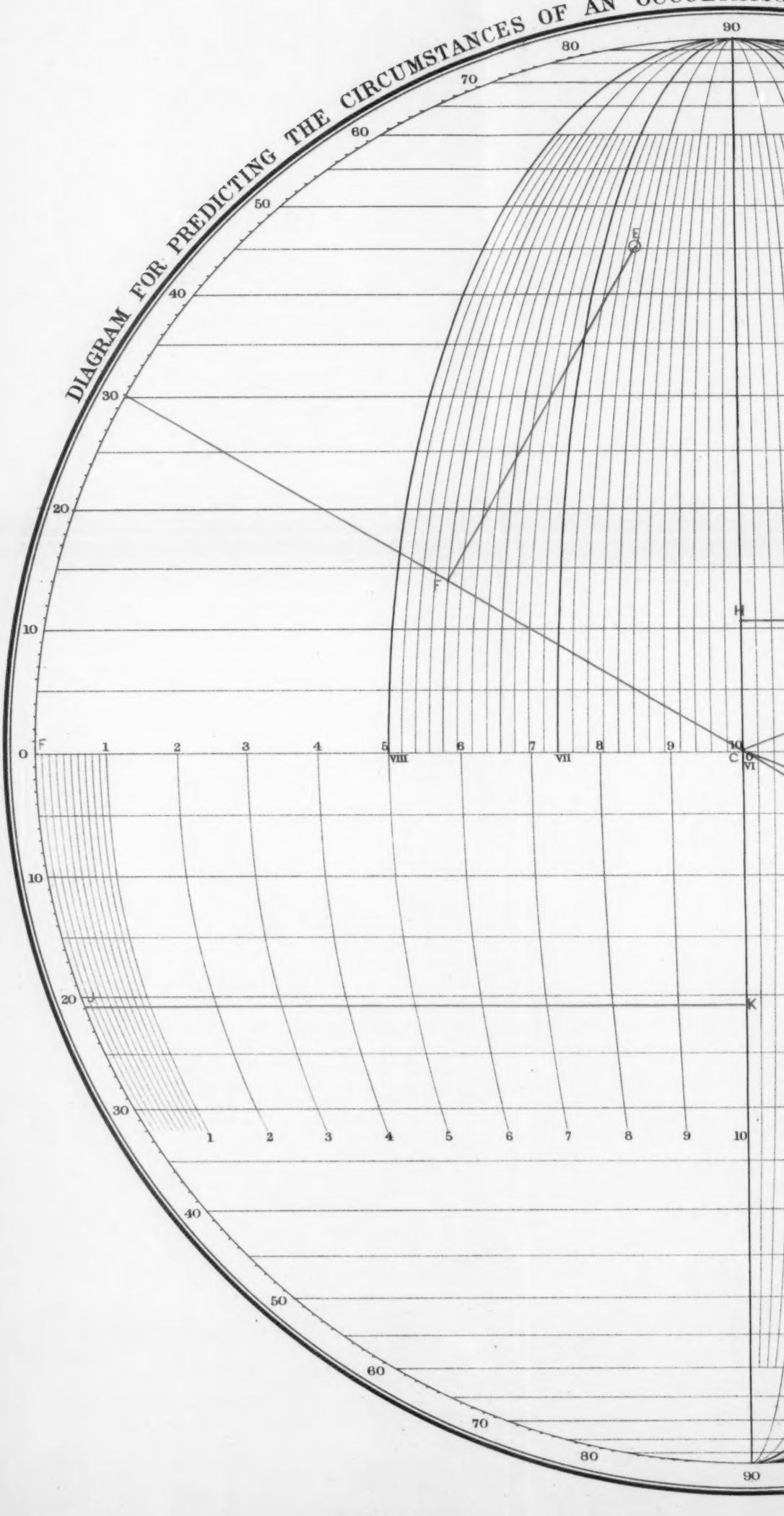

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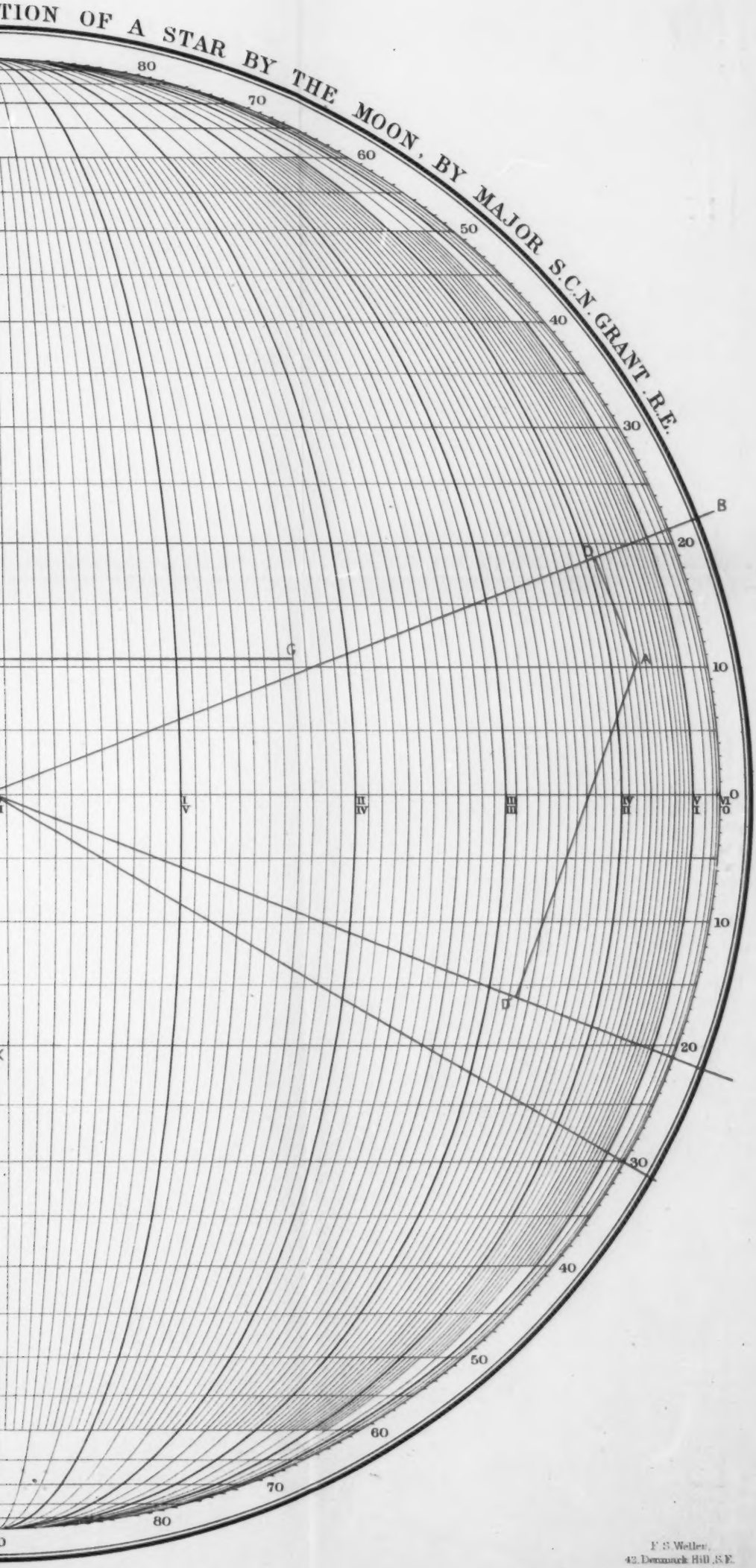

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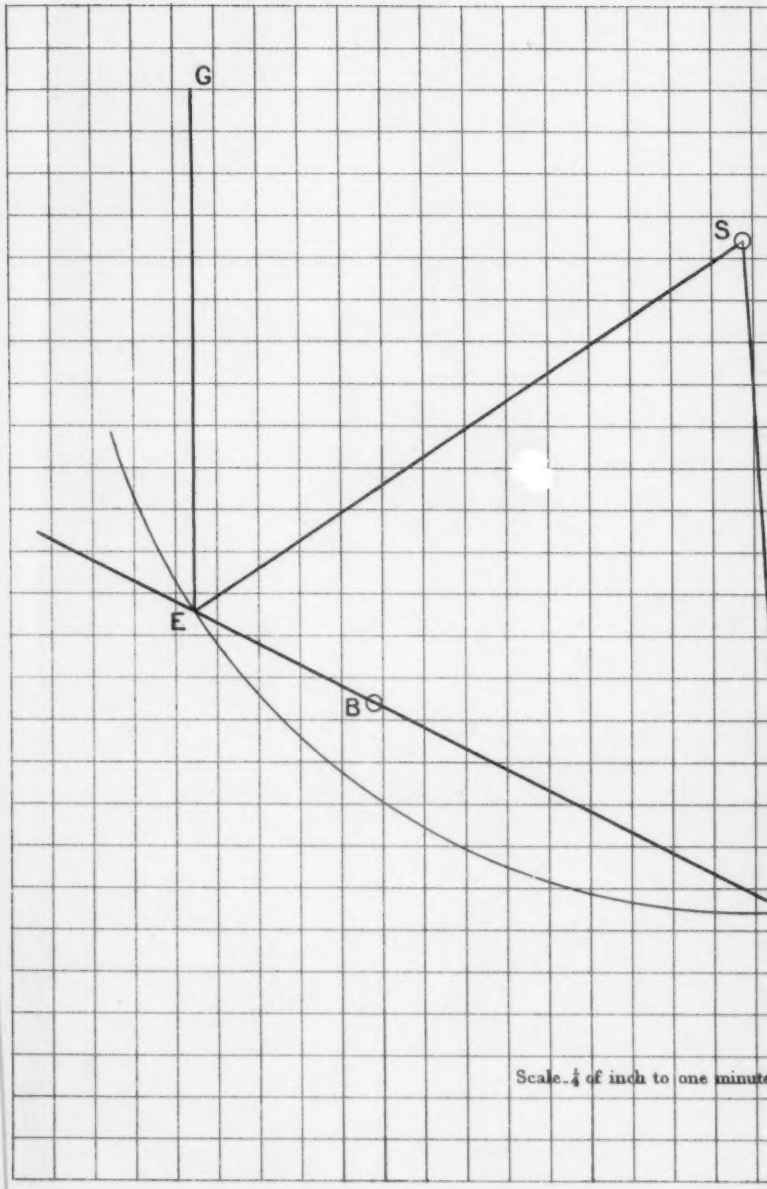
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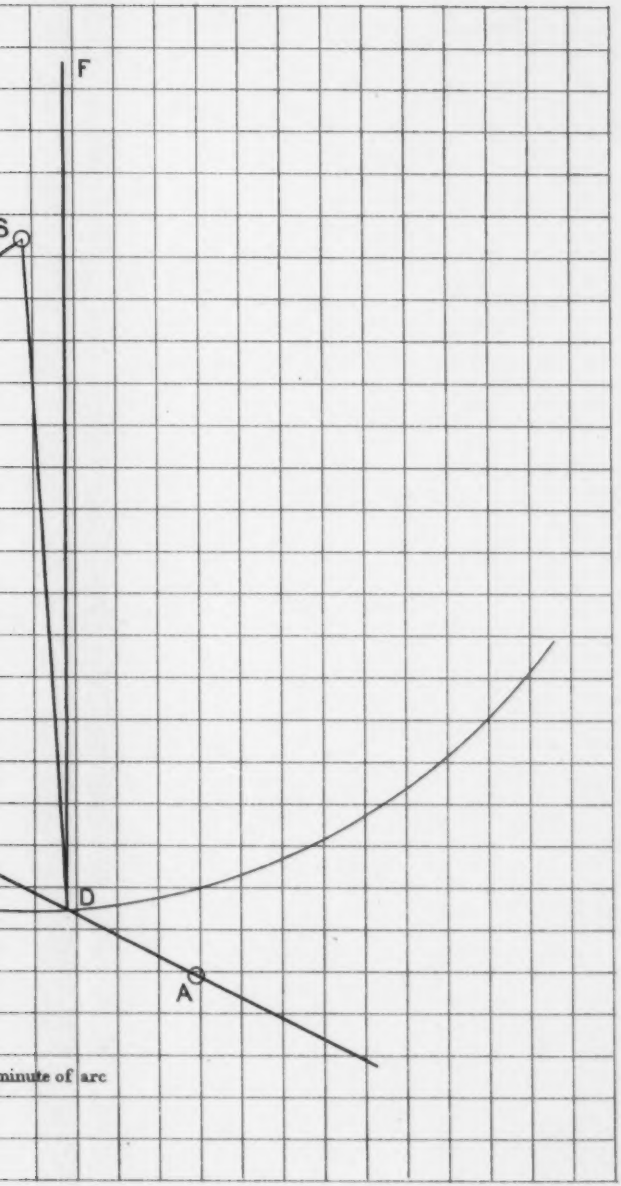
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INDEX.

A.

ABADEH, Persia, 172
Abbe, Mr. C., on the Capes of the Carolina Coast, 319, 334, 557
Abbildung der Halbkugeln, Zur, von Dr. Bludau (New Publications), 219
Abbott, Lieut.-Col., Census of India, 1891, Report, etc. (New Publications), 329
Abich, Dr., Caucasian travels of, Mr. Freshfield's remarks on, 656
Abo-toge pass, Japanese Alps, 128
Abulfeda's account of Kais, 648
Aburrow, Ch., Bi-Annual Report, etc., of Johannesburg Sanitary Committee (New Publications), 215
Abyssinia, New Maps—
  Nubia and Abyssinia, to illustrate Dongola Expedition, by W. and A. K. Johnston, 573
  Nuova Carta . . . nell' Eritrea e Regioni Limitrofe, 450
  Schizzo del Teatro della Guerra Italo-Abissina, 573
Abyssinia, New Publications—
  Die heutiger Lage der Italiener in Abessinien, von Dr. Paulitschke, 442
  Le Dembélas, by Colonel C. Airaghi, 678
Abyssinians, Glaser on the, Review, 420
Active and *Balæna*, Cruise of the, in Antarctic Seas, by W. S. Bruce, 502 *et seq.*; by C. W. Donald, 625 *et seq.*
Active sound, Antarctic, 632, 633
Ada river, Darfur, 428, 429
Adam, C. et H., Lettres de C. Huygens à Descartes (New Publications), 222
Adamawa, von Dr. Siegfried Passarge, review of, 272
Adi, Wadi, 522
Adige, New Publications—
  Die Etsch, von A. Penck, 109
Admiralty Charts (New Maps), 122, 343, 575
Admiralty Charts, New Publications—
  Catalogue of, 447
Afghanistan, Notes on, Major Raverty's, 547
Afghanistan, New Publications—
  At the Court of the Amir, by J. A. Gray, 212
Africa—
  British Central, boundaries of, 367; plateau land of, 367; labour question in, 374; progress in, 376, 377; natives, 376, 377; Arab question in, 378; minerals, 378; colonization of, 379, 380; slavery in, 381; industries, 385
  British Central, Geography and Resources of, by Alfred Sharpe, 366 *et seq.*
  British Central, A visit to Lake Chiuta in, by B. Codrington, 183
  Ethiopian Faunal Region of, 282 *et seq.*
  General Chapman's proposed mapping of, 414, 550
  Large mammals of, 285
  Mr. Scott-Elliot's book on, Note on, 660
  Old map of, published at Amsterdam, Dr. Peters on, 202
  South, photographs of, by Dr. E. Holub, 124
  West, Miss Kingsley's travels in, 95
Africa, New Publications—
  A Journey in West Africa, etc., by Capt. Lugard, 114
  A Naturalist in Mid-Africa, by G. F. Scott-Elliot, 331
  Aequatorial- und Süd-Afrika nach einer Darstellung von 1719, von Dr. C. Peters, 214
  Africa as a Field for Colonial Enterprise, by G. F. Scott-Elliot, 112
  Argus Annual and S. African Gazetteer, 564
  Big Game of South Africa, 332
  Commercial Prospects of British Central and East Africa, by G. F. Scott-Elliot, 678
  Der Ochsenwagen in Ostafrika, von J Graf Pfeil, 213
  Development of Tropical Africa, by Sir G. Baden-Powell, 679
  Durch Afrika von Ost nach West, von Graf von Götzen, 442
  Encore la question de la priorité de la découverte de l'Afrique Centrale, par A. Wauters, 113
  Extension of British Influence in Africa, by Capt. Lugard, 112
  Fate of South Africa, by F. R. Harris, 443
  Geschichten and Lieder der Afrikaner von A. Seidel, 678

Africa, New Publications—*continued.*
In Haunts of Wild Game, by F. V. Kirby, 332
L'Afrique australe et la colonization néerlandaise, par Dr. Ivens, 215
La Colonizzazione dell' Africa tropicale, by Prof. Sitta, 333
La traversée de l'Afrique Centrale, par Comte von Götzen, 331
Les Traités . . . en Afrique Centrale, von H. Schirmer, 442
Meteorologischen Beobachtungen . . . Marangu, 563
"Neue Aufnahmen deutscher Offiziere in Usagara," etc., von R. Kiepert, 563
New British Markets, III. Tropical Africa, by Capt. Lugard, 113
Padroado de Portugual em Africa, by Rev. de Himeria, 443
Possessi e Protettorati in Africa, 443
Proposed German Barrier across Africa, by Dr. J. W. Gregory, 332
Résultats scientifiques des voyages de M. Mizon, 214
Sept ans d'Afrique, La mission du Capt. Marchand, 114
South Africa, A Study in Colonial Administration, by W. Worsfold, 215
Stanford's Compendium of Geography and Travel, South Africa, by A. H. Keane, 113; *see also* 275
The Problem of the Races in Africa, by Lieut.-Colonel Elsdale, 678
Travels on Western Coast of Equatorial Africa, by Miss M. W. Kingsley, 564
Twelve Hundred Miles in a Waggon, by Alice B. Balfour, 332
Ueber die Uluguruberge in Deutsch-Ostafrika, von Dr. Stuhlmann, 214
Weissbuch. Sechszehnter Theil, 442
Zur Frage der Austrocknung Afrikas, von P. Reichard, 112
Zur Namenkunde von Deutsch-Süd-Westafrika, von P. H. Brincker, 332
Africa, New Maps—
Central and South, Bartholomew's New Map of, 342
Expedition des Deutschen Kamerun-comités, von Dr. Passarge, 451
Karte von Deutsch-Ostafrika, von Kiepert und Moisel, 450
Reiseweg des Lieut. Graf von Götzen in Deutsch-Ostafrika, 450
Spezialkarte von Deutsch-Ostafrika, von P. Krauss, 687
Africains, Nos explorateurs, par A. M. (New Publications), 339
African books, recent, by Ed. Heawood, 270
——— lakes and rivers, desiccation of, 367
——— natives, capabilities of, 386
——— Pioneers, The, by Capt. Pasfield Oliver (New Publications), 331
——— Subregion, West, of the geography of mammals, 290
Afternoon Technical Meetings of R.G.S., 106, 437, 559
Agro-Romano, New Publications—
Storia fisica dell Agro Romana, dell Dottore Angelis d'Ossat, 561
Ahlenius, K., Olaus Magnus' framställning . . . geografi (New Publications), 568
Ainsworth, J., on a Journey from Machako's to Kitwyi, 406
Air dans le sol, Sur la circulation de l', par M. M. Dehérain et Demoussy (New Publications), 448
Air, temperature of the, 542
Airaghi, Colonel C., Le Dembélas (New Publications), 678
Aische-en-Refail, New Publications—
Étude de Géographie locale, par Ed. Verhelst, 327
Aiya, V. Nagam, Report on the Census of Travancore (New Publications), 330
Akabat et Kahza, 524
Akka-Tagh, Tibet, 460, 462
Al Birain, 523
Al Haijar, Oman, 536
Al Makuba pass, Oman, 531
Alaska, New Publications—
Alaska as it was and is, by W. H. Dall, 333
Alexander, Cape, Antarctic, 633, 634
Alexander the Great, Life and Exploits of, by E. Wallis Budge (New Publications), 449
Algeria, M. Foureau's journey south of, 663
Algeria, New Maps—
Carte topographique de l'Algérie, 228
Algeria, New Publications—
The Shotts of Algeria and Tunis, 678
Algeria and Tunis, M. Gain's report on the influence of Drought on Vegetation, 430
Algeria and Tunis, New Publications—
Handbook for Travellers in, by Sir Lambert Playfair, 213
Mission . . . en Algérie et en Tunisie, par M. E. Gain, 331
Algué, P. José, Observatorio de Manila, Baquios ó Tifones de 1894 (New Publications), 213
Al-Kais, or Kais, Persian Gulf, 644
Allingham, W., Fast Passages and Best Routes (New Publications), 567, 571
Allison, Th., Early Ascent of Ruapehu (New Publications), 116
Alme, H. H., Om Spitsbergen og den Wellmanske polarexpedition (New Publications), 117
Alpinen Kartographie, Zur, von L. Obermair (New Publications), 218
Alps, Southern, of New Zealand, First crossing of the, by E. FitzGerald, 483 *et seq.*
Alps, New Publications—
Aus den Bergen der Maurienne und der Tarentaise, von Blodig und Purtscheller, 106
La recoloration des Alpes, par M. H. Dufour, 219

Alps, New Publications—*continued*.
Lignes directrices de la chaîne des Alps, par M. Haug, 326
Zur Alpinen Kartographie, von L. Obermair, 218
Alpsee, depth, etc., of, 199
Alsace-Lorraine, New Publications—
Niederschlagsverhältnisse im Ober-Elsass, von O. Rubel, 327
Untersuchungen über die Bodentemperaturen, von W. Boller, 327
Amakhosa, New Publications—
Les Ma-Khoça, par P. Jeanneret, 563
Amaral, Ferreira de, Luciano Cordeiro, and E. de Vasconcellos, Biographies of (New Publications), 119
Amazons, New Publications—
Der Amazonas, von D. von Schütz-Holzhausen, 335
Amber, Der Bernstein, von C. Mauch (New Publications), 570
Amda, Wadi, 523
America, New Publications—
Amerika, Eine allgemeine Landeskunde, von Deckert, Kükenthal und Sievers, 215
Deutsche Kolonisation in Südamerika, von Dr. Wiegand, 217
Die Zahl der Weissen im tropischen Amerika, von A. Oppel, 217
Geographischen Forschung in Nord-Amerika, von Dr. Deckert, 215
How the Latin-American Markets may be reached by the Manufacturers of the United States, 680
International American Conference, 679
Manual de las Repúblicas Americanas, 680
Menedez' Travels in, by F. Fonck, 681
American Conference, International, Reports of Committees, etc. (New Publications), 685
American Geographical Monographs, 319
American Republics, Bureau of the, Manual, Handbooks, Bulletins, etc. (New Publications), 680
American Schools, Local Maps in, Prof. Davis on, 665
Amu-darya, source of the, 197
Amurprovinz, Die, von Hauptmann Immanuel (New Publications), 213
Anarak, height of, 166
Anatolia, New Publications—
Die Grundlinien Anatoliens und Centralasiens, von Dr. Naumann, 329
Reisen in Anatolien, von Dr. Naumann, 329
Andalusia: *see* Spain
Andersen and Dunn, Messrs., Reports on the Conglomerate Prospection Expedition, British Guiana (New Publications), 445
Anderson, N., Færgerne, 1600–1709 (New Publications), 327
Andes, New Publications—
Viaje a los Andes Australes, por R. Lista, 682
Andrade, J., Nouvelles manifestations mécaniques de la rotation de la Terre (New Publications), 219
————, Sur une amplification mécanique . . . de la rotation de la Terre (New Publications), 219
Andrée, M., projected balloon voyage across the North Pole, 206, 325
————, Förslag till polarfärd med luftballong (New Publications), 567
————, Iakttagelser under en ballongfärd (New Publications), 448
Andros, par H. Hauttecœur (New Publications), 108
Anglo-Afghan Frontier Agreement, 546, 674
Anglo-Siamese boundary, 299
Angola, New Maps—
Carta dos Districtos de Benguella e Mossamedes, 687
Angola, New Publications—
L'Angola et la colonisation portugaise, par Ch. Delannoy, 678
La colonie portugaise d'Angola, par Dr. Rouire, 215
Angoni tribe, Central Africa, 370, 371
Angot, M., Sur le régime pluviométrique de l'Europe occidentale (New Publications), 110
Ani, Die Altarmenische Hauptstadt, von Krahmer (New Publications), 213
Annales de Géographie, Bibliography published by the, 74
Annam au Mékong, De l', par E. Mercié (New Publications), 111
Année Cartographique, L', par F. Schrader (New Maps), 342
Annenkoff, Général, Conférence sur l'importance de la Géographie, etc. (New Publications), 119
Anno Bon island, fauna of, 283
Anomalurus of Africa, 285
Anrique, N., Bibliografía Marítima Chilena (New Publications), 445
Antarctic—
Analysis of waters of the, 518
Cruise of the *Balæna* and *Active* in the; Part I., the *Balæna*, by W. S. Bruce, 502 *et seq.*; Part II., the *Active*, by Ch. W. Donald, 625 *et seq.*
Expedition to the, under Mr. Borchgrevink, 205, 325
Whales in the, 507; icebergs, 510, 511; colour of the sea, 512; currents, 513; meteorology, 513, 515; birds of the, 518; table of soundings, 519; table of temperatures, 520
Antarctic, New Publications—
Das unbekannte Südland, von Prof. Ruge, 337
Deutsche Expedition der Süd-Polar-Region, 337
Die Erforschung des Dirk Gerritsz-Archipel, von Dr. J. Petersen, 447

Antarctic, New Publications—*continued.*
Kapitän A. Larsens antarktische Forschung, 337
La zone polaire Australe, par J. Du Fief, 682
Marine Fauna of the Kerguelen Region, etc., by John Murray, 337, 538
Surviving Refugees . . . of Antarctic Life, by C. Hedley, 337
Zur Südpolarforschung, von F. Mewius, 447
Antelopes of the Ethiopian Region, 285
Anthropo-geography, New Publications—
Die Lage der menschlichen Ansiedelungen, von A. Hettner, 118
Anthropology, Prof. Keane's work on, 433
Anthropology, New Publications—
Du rôle de la femme dans la colonisation, par M. Lemire, 118
History of Mankind, by F. Ratzel, 118
Sia and Tusayan Snake Ceremonials, by J. W. Fewkes, 118
Antilles, Exploration aux, par M. P. Vibert (New Publications), 335
Arab invasion of Makran, 391, 392
Arab question in African colonization, 378
Arabia, Journal of an Excursion in Oman in, by Col. S. B. Miles, 522 *et seq.*
Arabia, New Publications—
Arabia and Abyssinia in Ancient Times, by J. W. M'Crindle, 570
Arabs of Oman, 533
Arad, New Publications—
Land und Leute des Comitates Arad, von Dr. Jankó, 561
Arana, D. B., La Cuestion de Limites entre Chile i la República Arjentina (New Publications), 217
Ararat, by W. Rickmer-Rickmers (New Publications), 110
Arbo, C., Udsigt . . . Norges anthropologiske forhold (New Publications), 439
Archinard, M., Le campagne 1892–93 au Soudan français (New Publications), 332
Arctic Expeditions—
Dr. Nansen's, 317, 555
Arctic Ocean, Lieut. Zhdanko on hydrographic researches in the, 555
Arctic Seaman, Honour to an, 556
Arctic, New Publications—
Arctic Cruise of the *Bear*, by Dr. S. Jackson, 447
Handbook of Arctic Discoveries, by General A. W. Greely, 566
Isforholdene i Nordhavet, af Carl Ryder, 447
Nagra anteckningar, etc., af A. Ohlin, 447
Om Björlings och Kallstenii expedition, af G. Nordenskiöld, 447
Om väderteksförhallandena . . . luftballong, af N. Ekholm, 567
Scope and Value of Arctic Explorations, by General Greely, 447
Tides of the Arctic Seas, by Rev. S. Haughton, 337
Argentine Government's surveys on the Pilcomayo, 83
Argentine, New Publications—
Argentinisch-chilenischen Grenzstreit, von J. J. Rohde, 680
Bureau of the American Republics: Argentine Republic, 680
Argentine and Chile, New Publications—
Chile und Argentinien in der patagonischen Kordillere, von Dr. Steffen, 217
La Cuestion de Limites entre Chile i la República Arjentina, por Arana und Valderrama, 217
Limites con la República Arjentina, by Don Ramon Montaner, 217
Armail, Armabel, or Lus Bela, 398, 399
Armenia, New Maps—
Armenian Question in Asia Minor, by W. and A. K. Johnston, 342
Verteilung der Armenischen Bevölkerung in Türkisch-Armenien, etc., von A. Supan, 342
Armenia, New Publications—
The Armenian Question, by H. Lynch, 440
Unbiassed view of the Armenian Question, by W. B. Harris, 112
Verbreitung der Armenier in der Asiatischen Türkei, nach Selenoy und Seidlitz, 440
Armenians in Asiatic Turkey and Transcaucasia, Distribution of, 312
————, percentage of, to the total population, 548
Armstrong, A., In a Mule Litter to the Tomb of Confucius (New Publications), 440.
Arnawai Valley, Central Asia, 547
Arnous, H., Gewichte, Masse, . . . in Korea (New Publications) 330
Arva, Jebel, Tripoli, 152
Arzruni, Prof., Reise nach Süd-Kaukasien (New Publications), 327
Ascension Island, fauna of, 283
Ascherslebeu, Zur Sprachgrenze um, von E. Damköhler (New Publications), 10
Ashanti, New Publications—
Ashanti and the Gold Coast, by W. Scott Dalgleish, 215
Further Correspondence relating to Affairs in, 442
Ashanti Expedition, W. and A. K. Johnston's map to illustrate the (New Maps), 121
Asia, Central, Dr. Sven Hedin's Journeys in, 195
————, MM. Grum Grjimailo's journeys in, 656
Asia, New Publications—
Das Klima Centralasiens, von A. Woeikof, 677
Das Klima Ost-Asiens, von W. Krebs, 329
Die Grundlinien Anatoliens und Centralasiens, von Dr. Naumann, 329

Asia—New Publications—*continued.*
Expedition der K. Russischen Geo. Gesell. in Mittelasien, von D. Krahmer, 677
Mission . . . dans la Haute-Asie, par MM. Dutreuil de Rhins et Grenard, 329
Orography of Central Asia, etc., by M. Obruchef, 440
Problems of the Far East, by Right Hon. G. N. Curzon, 440
The Heart of a Continent, Travels in Manchuria . . . and Chitral, by Capt. F. E. Younghusband, 562
Verwitterungs- und Deflationsprocesse in Central-Asien, by B. W. Obrutschew, 562
Asia Minor, Prof. Ramsay's work in, 190
Asia Minor, New Maps—
Itinerar-Aufnahmen im nordwestlichen Kleinasien, von Diest und Anton, 226
————, North-West, photographs of, by Messrs. Munro, Anderson, and Anthony, 344
Asia Minor, New Publications—
En Phrygie, par M. Radet, 329
Neue Forschungen im nordwestlichen Kleinasien, von Diest und Anton, 329
Reisen in Anatolien, von Dr. Naumann, 329
Asiatic Turkey and Transcaucasia, Distribution of Armenians in, 312
Assa depression, low level of the, 657
Assam, Prince Henry of Orleans' Journey to, 199
Assam, New Publications—
Report on Administration of, for 1894-95..677
Assam-Burma Railways, Proposed Connection of, 202
Assmann, Dr., Ergebnisse der Gewitter-Beobachtungen im Jahre 1891 (New Publications), 108
Astronomie und Geophysik, Jahrbuch der, von Dr. Klein (New Publications), 448
Astrup, Lieut. E., Death of, 209
————, Det arktiske problem og de to Peary—expeditioner (New Publications), 117
————, von Dr. Nielsen (New Publications), 449
Athi plains and rivers, 662
Athi river, 406, 410
Atlantic, North, Bottle-Voyage, 102
Atlantic, warm axis in the, 264
Atlantic Ocean, New Maps—
Pilot Charts of the North Atlantic, 124, 452
Atlas Universal de Géographie, par F. Schrader (New Maps), 343
Atmospheric Temperature in the Southern Hemisphere, Prof. Hann on, 556
Aurora, New Publications—
Effet de l'humidité . . . de l'aurore boréale, par A. Paulsen, 448
Australasian Colonies, History of the, by Ed. Jenks (New Publications), 336
Australia, South, Geological Explorations in, Mr. Brown's Report, 554
Australia, New Publications—
Aboriginal Bora held at Gundabloni in 1894, by R. H. Mathews, 116
Aboriginal Rock Pictures of, by R. H. Mathews, 116
Australia as a Strategic Base, by A. S. White, 446
Australian Fungi, etc., by D. McAlpine, 336
Australian Handbook, by Gordon and Gotch, 682
Australien und Ozeanien, von Prof. W. Sievers, 335
Discovery of, by G. Collingridge, 446
Geographical History of Australian Continent, by Hon. A. C. Gregory, 682
Meteorological observations made in South Australia, by Sir C. Todd, 682
Notes on Coolgardie Gold Fields, by D. C. Chewings, 682
Scientific Exploration of Central Australia, by W. A. Horn, 446
South Australia, Government Geologist's Report, 336
Western Australia, by Sir W. Robinson, 116
————, its History and Progress, by A. F. Calvert, 566
————, Mining Handbook, by H. P. Woodward, 336
Western Australian Blue Book for 1894..116
———— Year-Book for 1893-94, by M. A. Fraser, 116
Year-Book of Australia for 1895, edited by the Hon. Ed. Greville, 116
Australia, New Maps—
Western Australian Goldfields (London and Western Australian Exploration Company), 451
————, by Bewick, Moreing and Co., 573
Western Australia, showing goldfields, by A. F. Calvert, 574
Austria, New Publications—
Astronomische Arbeiten der Oesterreichischen Gradmessungs-Commission, von Drs. Herr und Tinter, 106
Jahrbuch des K. K. hydrographischen Central-Bureau, 107
Leistungen der österreichischen Staatsinstitute, 438
Autruche de Barbarie, L', par J. Forest (New Publications), 442
Auvergne à l'Atlantique, De l', par Dr. Collignon (New Publications), 327
Avalanche Basin, Montana Rockies, by L. B. Sperry (New Publications), 444
Awemba country, Central Africa, 204
Ax-i-Rustam, Persia, 26
Azande tribe, 428
Azores, New Publications—
Archivo dos Açores, 560

B.

Bachem, Kapt.-Lieut., Fahrt in den Bimbia-Fluss und Reise von Kamerun (New Publications), 113
Baden-Powell, Sir G., Development of Tropical Africa (New Publications), 679
Bagdad, Freiherr v. Oppenheim's journey from Damascus to, 548, 658
Bahamas, New Publications—
The Sisal Industry in the Bahamas, by Dr. D. Morris, 566
Balæna and *Active*, Cruise of the, in Antarctic Seas, by W. S. Bruce, 502 *et seq.*
Balegga tribe, Central Africa, 273 *and note*
Balfour, Commander, Deep Soundings in the Pacific found by, 318
Balfour, Miss A. B., Twelve Hundred Miles in a Waggon (New Publications), 332
Balkan Peninsula, High-level Meteorological Station in the, 544
Ballagh, J. C., White Servitude in Virginia (New Publications), 216
Ballif, P., Wasserbauten in Bosnien und der Hercegovina (New Publications), 438
Balloon voyage to the North Pole, M. Andrée's projected, 206
Ballooning, New Publications—
A Trip Heavenward, by B. Baden Powell, 119
Contribution à la bibliographie de la locomotion aérienne, par A. Wouwermans, 223
Geographisches aus dem Luftballon, von A. Berson, 448, *see also* 541
Iakttagelser under en ballongfärd, af S. Andrée, 448
Balloons in Geographical Work, the Use of, by A. Berson, 541
Balochis, The Northern, by O. V. Yates (New Publications), 110
Baltic, Evolution of the, Prof. Credner on the, 425
Baltic, New Publications—
Entstehung der Ostsee, von Dr. Credner, 220
Hydrographie . . . der Ostsee, von Dr. Schott, 448
Baltimore, New Publications—
City Government of, by Th. P. Thomas, 444
Balu Chaung river, Shang States, 579
Baluchistan, Southern, ethnographical conditions of, 388
Ban Law ferry, Mekong, 585
Band, ancient town of, 673
Banda tribe, 428, 429
Bandassi village, position of, 429
Bangkok, New Publications—
Bangkok, von Otto E. Ehlers, 678
Bangs, O., Geographical distribution of the Cotton-tail, etc. (New Publications), 334
Bangweolo, Lake, desiccation of, 368
Bangweolo, meaning of word, 378
Banjia tribe, 428
Bannwaldsee, depth, etc., of, 199
Barbier, M., Irrégularités orthographiques des noms de lieux (New Publications), 222
———, Rôle des voyageuses françaises (New Publications), 224
Barcones, E. M., Estudios para una Nosologia Filipina (New Publications), 112
Barents Sea, Lieut. Zhdanko on hydrographic researches in, 555
Barotse Country, Capt. Bertrand's Expedition to the, 426
———, Capt. Gibbons' explorations in the, 662
Barra do Rio Licungo, Reconhecimento hydrographico da (New Maps), 687
Barrett, C., Surrey: Highways, Byways, and Waterways (New Publications), 328
Barrow, C. L., remarks on "First Crossing of the Southern Alps of New Zealand," 501
Barsîsâ, Die Legende vom, von Drs. Goldziher und Landberg-Hallberger (New Publications), 340
Bartholomew, J. G., Joseph Thomson (New Publications), 119
———, The Royal Scottish Geographical Society's Atlas of Scotland (New Maps), 120
———, Travellers' Route Chart of the World (New Maps), 452
Bartholomew's New Map of Central and South Africa (New Maps), 342
Bas-Quercy, Une grande industrie du, par J. Gebelin (New Publications), 107
Baschin, Herr O., Geographical Bibliography of, 73
———, Zur Frage des jahreszeitlichen Luftanstauches, etc. (New Publications), 118
Bashgal valley, Central Asia, 547
Bashgol river, 42
Bassenthwaite, origin of, 616
Bassin houiller du Nord, par M. Gilles (New Publications), 438
Bastak, Persia, 25
Batak Land, geography of, 76; great lake of, 77; geology, 78; fauna and flora, 78, 80; Dutch colonization in, 80; people of, 81
Batak Land, New Publications—
De Verkenning der Bataklanden, door C. M. Pleyte Wzn, 331
Bataks, The Land of the, by Baron A. von Hügel, 75, 175; *see also* 563
Bataks: dress, ornaments, and wood-carving of, 176; houses of, 177; domestic animals of, 178; industries of, 179; social life of, 180; religions of, 180; cannibalism, 181; literature of, 182
Batavia, New Publications—
Longitude de Batavia, par J. Oudemans, 330
Bats of Madagascar, 288

Baudouin, M., Le problème bibliographique (New Publications), 223
Bauer, L. A., Halley's Earliest Equal Variation Chart (New Publications), 449
————, On the Distribution . . . of Terrestrial Magnetism (New Publications), 219
Bebber, Dr. van, Die Wetterdienst an der Deutschen Seewarte (New Publications), 118
————, Die Klimate der Erde und ihr Einfluss auf den Menschen (New Publications), 568
Bedford, Rev. W., Malta and the Maltese Race (New Publications), 439
Beehive mount, glacial striæ on, 55
Begg, A., Notes on Vancouver Island (New Publications), 215
Behr, H. H., Changes in Flora and Fauna (New Publications), 679
Beida, Jebel, 527
Belda, New State of, in the Central Sudan, 313
Belgian monument to Captain Coquilhat, 557
Bell, H. C. P., Report of Archæological Survey in Sigiriya (New Publications), 562
Bell, Dr. R., explorations in province of Quebec, 413
————, Proofs of the Rising of Land around Hudson Bay (New Publications), 564
Belloc, E., Recherches et explorations, etc., dans les Pyrénées Centrales (New Publications), 109
Ben Chaung, or Nam Pang, Shan States, 580
Bénet, M., Notes pittoresques sur les îles Loyalty (New Publications), 218
Bénoué, Itinéraire de la source de la, etc., par M. Mizon (New Publications), 214
Bent, J. T., The Land of Frankincense and Myrrh (New Publications), 110
————, Muscat (New Publications), 110
Berlin Geographical Society's Bibliography, 72
Bernard, A., L'Archipel de la Nouvelle-Calédonie (New Publications), 116
Bernardières, M. de, Sur la construction de nouvelles Cartes magnétiques, etc. (New Publications), 219
Bernstein, Der, von Chris. Mauch (New Publications), 570
Berson, A., Geographisches aus dem Luftballon (New Publications), 448
————, The Use of Balloons in Geographical Work, 541
Berthoud, P., Lourenço Marques (New Publications), 563
Bertrand, Captain, Expedition to the Barotse Country, 426
Betydningen af Landenes geografiske Forhold, af O. E. Madsen (New Publications), 685
Bevan, Th., Discovery of the Great Purari (New Publications), 218
Bewick, Moreing and Co., Map of the Western Australian Goldfields (New Maps), 573
Beyaza, Persia, 32
Bezold, W., Der normale Erdmagnetismus (New Publications), 568
Bibliographies, Recent Geographical, by Dr. H. R. Mill, 72
Bibliography, New Publications—
Greek Bibliography, by Sakkelionos, 223
Index to Periodicals of 1894, by Hetherington, 223
Le problème bibliographique, par M. Baudouin, 223
Torch and Colonial Book Circular, by E. A. Petherick, 223
Bibliotheca Geographica, 73
Bicknell, A. C., Travel . . . in N. Queensland (New Publications), 336
Bida, New Publications—
Visit to, Bishop Tugwell's Diary, 443
Big Game Shooting, by Clive Phillipps-Wolley (New Publications), 224
Bigelow, F. H., The Earth a Magnetic Shell (New Publications), 219
Bihé, Expedição ao, by A. de Paiva (New Publications), 214
Bimbia-Fluss, Fahrt in den, und Reise von Kamerun, von Kapt.-Lieut. Bachem (New Publications), 113
Bio-Geography of Mexico, etc., by C. H. T. Townsend (New Publications), 333
Biography, Dictionary of National, by Sidney Lee (New Publications), 449
Biolley, P., Du lac de Grenade . . . par le fleuve San Juan (New Publications), 565
Biological collections of the *Balæna* expedition, 518
Bird-catching in the Færoes, 19
Biscay, Bay of, New Publications—
Mission Scientifique dans le Golfe de Gascogne, par M. de Kergrohen, 683
Stromversetzungen vor der Bucht von Biscaya, von L. Dinklage, 326
Bismarck Archipelago, New Publications—
Languages of the, by S. H. Ray, 218
Bizerta, New Publications—
Bizerte et son nouveau port, par M. Maumené, 215
Bjelašnica peak, Meteorological Observatory on, 544
Blache, V. de la, Le principe de la géographie générale (New Publications), 340
Black, W. G., Summer Meteorology (New Publications), 338
Blackmore & Colomb, Manœuvring Powers of Steamships (New Publications), 571
Bladen, F. M., Historical Records of New South Wales (New Publications), 446
Blandford, W. F. H., The Tsetse Fly Disease (New Publications), 686
Blanford, Dr. W. T., remarks on "The Waterways of English Lakeland," 622
Blantyre, progress in, 382, 383
Bleng and Irt rivers, Lakeland, 619

Bliss, Dr., Narrative of an Expedition to Moab and Gilead (New Publications), 112
Blodgett, J. H., "Free Burghs" in United States (New Publications), 564
Blodig und Purtscheller, Drs., Aus den Bergen der Maurienne und der Tarentaise (New Publications), 106
Bludau, Dr., Ueber die Wahl der Projektionen für die Länderkarten der Hand- und Schulatlanten (New Publications), 117
————, Zur Abbildung der Halbkugeln (New Publications), 219
Bluzet, Lieut., Explorations in the Timbuktu Region, 98
————, La région de Timbouctou (New Publications), 214
Boaz, F., Sprachenkarte von Britisch-Columbien (New Maps), 342
Bogdanowitch, K., Einige Bemerkungen über das System des Kwenlun (New Publications), 331
Bogdo ola lake and peak, 657
Bogue, V. G., Stampede Pass, Cascade Range (New Publications), 444
Bokaha, New Publications—
Quelques notes sur le pays, habitants, et ses ressources, par E. Thomas, 564
Bokhara, New Publications—
Une visite à la prison de Bokhara, par M. Laurent, 329
Bolivia, New Maps—
Carta Corográfica del Departamento de, por F. Simons, 228
Bolivia, New Publications—
Bureau of American Republics, Bulletins, 680
Bolivia and Peru, Recent Discoveries in the Basin of the Madre de Dios in, by C. R. Markham, 187
Bolivia-Paraguay Frontier, Dr. Polakowsky on the, 205
Boller, W., Untersuchungen über die Bodentemperaturen (New Publications), 327
Bolton, J., The Facts about the Venezuela Boundary (New Publications), 334
Bombay, New Publications—
Magnetical and Meteorological Observations made at, 677
Bonney, T. G., Ice-Work, Present and Past (New Publications), 567
Bonnier, G., Les plantes de la région alpine, etc. (New Publications), 118
Bonola Bey, F., In Memoria di Carlo Piaggia (New Publications), 222
Borchert, O., von A. Miessler (New Publications), 339
Borchgrevink, E., expedition to the Antarctic under, 205, 325
Borneo, New Publications—
Die Niederländische Expedition nach Zentral-Borneo, von Prof. Molengraaff, 110
Schetsen uit Borneo's Westerafdeeling, door E. Kühr, 441
Bornhaupt, C. von, Die deutschen Bestrebungen an der Somali-Küste (New Publications), 113
Boro Khoro mountains, Central Asia, 657
Bororós, Algunos datos sobre los, por J. Koslowsky (New Publications), 445
Bosnia-Herzegovina, New Publications—
Meteorologischen Beobachtungen in, 438
Rambles, etc., in, by Dr. Munro, 212
Wasserbauten in, von P. Balliff, 438
Boston Basin, South-western part of the, by J. L. Tilton (New Publications), 334
Botany, Department of, Guide to the British Mycetozoa, by A. Lister (New Publications), 448
Böttego, Capt., progress of expedition to Somaliland, 99, 553
————, review of book, 274
Bottle-Voyage in the North Atlantic, 102
Boudène au Mas Cabanis, Les cavernes de la, par F. Mazauric (New Publications), 438
Bouilhac, R., Sur la mise en culture des terres de bruyères de la Dordogne (New Publications), 107
Boundaries of British Guiana—The Evidence of Maps, by C. R. Markham, 277, 309
Boundary Treaties in Siam and Indo-China, 297
Boussinesq, J., Lois de l'extinction d'une houle simple en haute mer (New Publications), 118
Bøving-Petersen, J. O., En Bestigning af Brasiliens højeste Bjærg (New Publications), 115
————, Et Besøg i Centralbrasiliens Knoylehuler (New Publications), 565
Bow River Valley, Canadian Rockies, 50, 56
Brabner, J. H., Gazetteer by, Note on, 417
————, The Comprehensive Gazetteer of England and Wales (New Publications), 110
Bradyseisms, movements of the Earth's crust, 230
Braudstetter, Dr., Malaio-Polynesische Forschungen (New Publications), 222
Brazil, Pedro II. of, Memoria de (New Publications), 684
Brazil, New Publications—
Brazilian Argentine Boundary, 565
Commission d'Exploration du Plateau Central du Brésil, Rapport, par L. Cruls, 115
En Bestigning af Brasiliens højeste Bjærg, by Bøving-Petersen, 115
Et Besøg i Centralbrasiliens Knoylehuler, etc., by J. O. Bøving-Petersen, 565
Voyage de M. Desvernine au Brésil, 445
Brehm, A. E., From North Pole to Equator (New Publications), 686
Brenner, Baron von, The Land of the Bataks, Review of, 75

Bretschneider, E., map of China and Surrounding Regions (New Maps), 687
Brigham, A. P., Composite Origin of Topographic Forms (New Publications), 220
Brincker, P. H., Zur Namenkunde von Deutsch-Süd-Westafrika (New Publications), 332
Brion, M. E., Les Colonies italiennes (New Publications), 214
British Association, Ipswich, 1895, Report of the (New Publications), 340
British Central Africa: *see* Africa
British Columbia and Quebec, New Maps—Indexed Pocket Map, etc., Rand, McNally & Co.'s, 451
British Columbia, New Publications—
Annual Report, Geological Survey of Canada, by G. M. Dawson, 679
Report on Mining Operations in, for 1894..564
British Columbia, New Maps—
Map of, by Hon. G. B. Martin, 342
Sprachenkarte von Britisch-Columbien, von Fr. Boaz, 342
British Empire, New Publications—
Growth of British Empire, 570
British Guiana—
and Venezuelan Boundary Frontier, Mr. Dixon's note on, 99
Boundaries of, The Evidence of Maps, by C. R. Markham, 277, 309
British Title to, Mr. Markham's Note on, 100
Note to Sketch-Map of the Upper Kuyuni in, by Lieut. Godfrey-Faussett, 541
British Guiana, New Maps—
Special Map of, by G. Philip and Son, 342
Stanford's Map of Guiana and Venezuela, 342
British Guiana, New Publications—
British Guiana; a Sketch, by Sir D. Chalmers, 565
Documents . . . on Boundary between Venezuela and, 445
Grenze von Britisch-Guayana, von H. Wichmann, 445
Question of British Guiana Boundary, 565
Reports on Conglomerate Prospection Expedition, by Messrs. Anderson and Dunn, 445
Seamy side of, by Fr. Comyn, 445
Venezuela and British Guiana Boundary, by Dr. H. R. Mill, 217
British India, From Yun-Nan to, by Prince Henry of Orleans, 300
British Islands, Proposed Geographical Description of the, etc., by Dr. H. R. Mill, 345 *et seq.*
British Mycetozoa, Guide to the, by A. Lister (New Publications), 448
British New Guinea, by Sir W. Macgregor (New Publications), 116
Broeker, D., Die Faerper-Gruppe (New Publications), 107
Brower, J. V., Prehistoric Man at . . . Mississippi R. (New Publications), 565
Brown, H. Y. L., Report on Geological Explorations in South Australia, 554
Brown, —, South Australia, Government Geologist's Report (New Publications), 336
Browne, C. R., Ethnography of county Mayo (New Publications), 328
Bruce, W. S., Cruise of the *Balæna* and *Active* in Antarctic Seas, 502 *et seq.*
Brunias, Alex., Les imitateurs de, par M. Hamy (New Publications), 569
Buchan, Dr. A., Specific Gravities, etc. (New Publications), 683
Buchanan, J. Y., The Guinea and Equatorial Currents, 267
Budapest, New Publications—
Resultate der Volksbeschreibungs und Volkszählung, von J. Körösi und Dr. Thirring, 108
Budge, E. Wallis, Life and Exploits of Alexander the Great (New Publications), 449
Buenos Ayres, New Publications—
Memoria . . . por Dr. E. Frers, 334
Nota sobre la industria, etc., by Dr. Lahille, 444
Bugonia-Lore of the Ancients, by C. R. Osten Sacken (New Publications), 224
Bureau, Ed., La flore de Madagascar (New Publications), 443
Burma, New Publications—
Der Aussatz in Birma, 677
Burma-Karenni Railway, 601
Burton, Lady, death of, 559
Byström, H., Sverige i utländska Kartverk (New Publications), 561

C.

Cabot, John, voyage to America, Centenary of, 675
Cabots, Voyages of the, in 1497 and 1498, by S. E. Dawson (New Publications), 114
Cadell, H. M., Geology and Scenery of Sutherland (New Publications), 561
Caillaud, M. du, on Friar Odoric's Island of Dondin, 659
Calcul rigoureux du point à la mer, etc., par M. J. Ripol (New Publications), 337
California, New Publications—
Changes in Flora and Fauna of, H. H. Behr, 679
Mount Goddard and its Vicinity, by T. S. Solomons, 444
Calvert, A. F., Map of Western Australia, showing goldfields (New Maps), 573
———, Western Australia; its History and Progress (New Publications), 566

Calvo, J. B., Republic of Costa Rica (New Publications), 681
Cameroons frontier, 552
——— Peak, Miss Kingsley's ascent of, 96
Cameroons, New Publications—
Begleitworte zu den Karten "Reiseroute der Expedition des deutschen Kamerunkomitees," von Dr. M. Limpricht, 114
Om Kamerunomradet, af P. Dusén, 443
Canada, Geological Survey of, Geographical work of the, in 1895, by Dr. Dawson, 412
———, Mr. O'Sullivan's explorations in, 315
Canada, New Publications—
Canada, by Earl of Derby, 114
Forests of Canada, by J. Macoun, 114
Geological Survey, Annual Report, 414
——— ———, List of Publications, 333
Lecture on New British Route to Pacific, by Colonel J. Harris, 564
Report of Geological Survey Department, 1895 .. 679
Report on Mining Section in Alberni District, by W. J. Sutton, 564
Statistical Year Book for 1894 .. 353
Tides and Currents in Canadian Waters, by W. B. Dawson, 679
Canadian Rocky Mountains, Lake Louise in the, by W. D. Wilcox, 49 *et seq.*
Canary Islands, New Publications—
Der Insel Tenerife und ihre Bewohner, von Dr. Meyer, 113
Les Anversois aux Canaries, par M. Donnet, 112
Canterbury and Westland, Notes on the Meteorology of, by J. T. Meeson (New Publications), 116
Cape Cod Canal, United States, 553
Cape Horn, The Gold Diggings of, by J. R. Spears (New Publications), 335
Cape Subregion of the Geography of Mammals, 291
Capitaine, Les, par L. Drapeyron (New Publications), 684
Cappelle, Dr. H., Bijdrage tot de Kennis van het Gemeng de Diluvium (New Publications), 683
Cardioid Earth, The, by W. L. Jordan (New Publications), 224
Carlheim-Gyllenskköld, V., Determinations des éléments magnétiques (New Publications), 328
Carlson, E., Columbus and Toscanelli, eller frågan . . . Indien (New Publications), 568
Carmen, Beni river, 188, 189
Carnivora of the Ethiopian Region, 285, 288
Carnivora, New Publications—
Geographische Verbreitung der jetzt lebenden Raubthiere, von C. Grevé, 448
Carolina, New Publications—
Cuspate Capes of the Carolina Coast, by C. Abbe, 334
Carpathians, New Publications—
Jahrbuch des Ungarischen Karpathen-Vereines, 561
Carrock Fell, 611
Cartier's Course—a Last Word, by the Right Rev. M. F. Howley (New Publications), 114
Cartographique, L'Année, par F. Schrader (New Maps), 342
Case, E. C., Experiments in Ice Motion (New Publications), 338
Castilho, A. de, A provincia de S. Thomé (New Publications), 443
Caucasia, Ethnography of, 547
Caucasian travels of Dr. Abich, Mr. Freshfield's remarks on, 656
Caucasus, New Maps—
Karte des nordöstlichen Kaukasus, von Dr. Radde, 225
Caucasus, New Publications—
Géologie . . . du Caucase central, par M. Fournier, 327
Reise nach Süd Kaukasien, von Prof. Arzruni, 327
Caustier, E., and others, Ce qu'il faut connaître de Madagascar (New Publications), 113
Celebes, F. and P. Sarasin's explorations in, 205
Celebes, New Publications—
Besuch auf Buton and Süd-Celebes, von Dr. G. Radde, 563
Reiseberichte aus Celebes, von P. und F. Sarasin, 212, 678
Cerro Viejo and its Volcanic Cones, by J. Crawford (New Publications), 334
Ceylon Branch of the Royal Asiatic Society, Catalogue of Library of (New Publications), 570
Ceylon, New Publications—
Eine Woche in Ceylon, von Dr. G. Radde, 562
Chaco Indians of the Pilcomayo, 83
Chaffanjon, M., journey in Mongolia and Manchuria, 550
Chah-Beg, Persia, 172
Chaigneau, J. F., Instrucciones Nauticas de la Costa de Chile (New Publications), 115
Chaix, Prof. E., Les côtes des Iles Normandes de la Manche (New Publications), 438
Chaix, P., Le Général Sir Henry Rawlinson (New Publications), 119
Challenger Medal presented by Dr. John Murray, 206
Chalmers, Sir D., British Guiana (New Publications), 565
Chalmers, Mr. R., explorations south of the St. Lawrence, 413
———, Pleistocene Marine Shore-lines on South Side of St. Lawrence Valley (New Publications), 679

Chamberlain, B. H., Essay in aid of a Grammar and Dictionary of the Luchuan Language (New Publications), 441
Chambers, H. E., Constitutional History of Hawaii (New Publications), 446
Chandless, the late W., legacy from, 655
Channel Islands, New Publications—
Les côtes des Iles Normandes de la Manche, par M. E. Chaix, 438
Channing, E., The United States of America, 1765–1865 (New Publications), 679
Chao Ju-Kua, by F. Hirth (New Publications), 339
Chapman, Gen., on the mapping of Africa, 414, 550
Charemaru Peak, Tibet, 467
Charts, New Maps—
Admiralty, 122, 343, 575
Cancelled, 123, 344, 575
Corrected, 124, 345, 576
United States Hydrographic, 124, 228, 452
Chauvigné, A., Géographie, etc, de la Champagne (New Publications), 327
Chavannes, E., Les résultats de la guerre entre la Chine et le Japan (New Publications), 329
Chechikweyo's town, 184
Cheesewright, F. H., the Mexican Drainage Canal (New Publications), 444
Chengtu-fu plain, Western China, 201
Cherchen, town and river, Tibet, 458, 460
Chernyshev, M., expedition to Novaya Zemlya, 206, 425
Cherso, New Publications—
Cherso, Isola nel Quarnero, by Prof. Czink, 560
Chervin, Dr., La situation démographique de la France en Europe (New Publications), 327
Chesapeake-Albemarle Canal, 554
Chevrot, M., Exploration du Gouffre de Pierrefeu (New Publications), 438
Chewings, Dr. C., Notes on Coolgardie Gold Fields (New Publications), 682
Chijs, J., van der, Nederlandsch-Indisch Plakaatboek (New Publications), 562
————————, Dagh-Register gehouden in Casteel Batavia (New Publications), 562
Childers, Right Hon. H., Obituary of, 324
Chile, Drs. Steffen and Krüger's explorations in, 101
Chile, New Maps—
Hydrographic Charts, 452
Chile, New Publications—
Anuario hidrografico de la Marina de Chile, 335
Bemerkungen . . . Verschiedenheit zwischen Patagonien und Chile, von Dr. R. A. Philippi, 680
Bibliografía Marítima Chilena, por N. Anrique, 445
Chile und die Deutschen Colonien, von H. Kunz, 565
Die Thermen von Chillan in Chile, von Dr. Reiche, 335
Chile, New Publications—*continued*.
Instrucciones Nauticas de la Costa de Chile, par J. F. Chaigneau, 115
Chile and Argentine, New Publications—
Boundary Questions of, by Arana, Valderrama, Steffen and Montaner, 217
China and Tongking boundary, 299
—— system of Japanese Alps, 126
——, Western, Mr. A. von Rosthorn's Journey in, 201
China, New Maps—
China and Surrounding Regions, by E. Bretschneider, 687
China, New Publications—
Der zukünftige Handel Chinas, von Dr. Markoff, 440
Imperial Maritime Customs, Trade Reports, 110
2500 kilometer opover Yangtse Kiang af W. Coucheron-Aamot, 111
Mesny's Chinese Miscellany, 111
Treaty Series, Convention between Great Britain and China, etc., relative to Burmah and Tibet, 111
China and France, New Publications—
Délimitation et de commerce . . . entre la France et la Chine, 440
China and Japan, New Publications—
Résultats de la guerre entre la Chine et le Japon, par M. Chavannes, 329
Chinchona, New Publications—
Étude des arbres à quinquina, par Dr. Verrier, 219
Chin-chuan district, Western China, 201
Chinese monetary system, 456
Chinoises, Histoire des Études, par H. Cordier (New Publications), 338
Chiromo to Blantyre, railway from, 384
Chisholm, G. G., Cuinet's 'Turkey in Asia'—Review, 281
————————, 'Gazetteer of the World,' Note on, 416
————————, Remarks on "Proposed Geographical Description of the British Islands," 363
————————, Review of Colonial Systems and Colonizing Peoples, by M. Dubois, 193
Chitral, New Publications—
New Dangers and Fresh Wrongs, by Dr. Leitner, 111
Relief of, by Captains G. J. and F. E. Younghusband, 212
Chittenden, H. M., Yellowstone National Park (New Publications), 680
Chiuta Lake, A visit to, in British Central Africa, by Robert Codrington, 183
Choffat, P., Promenade aus Gerez (New Publications), 439
Chokaisan volcano, Japan, 148
Christie, R. B., Lieut Sparrow, and Major Mainwaring, Sketch of the Routes in Somaliland (New Maps), 121
Church Missionary Society, Proceedings of the (New Publications), 223
Clarence Island, Antarctic, 516, 642

Clermont-Ganneau, C., Archæological Researches in Palestine, 1873–74 (New Publications), 678
Climate, New Publications—
Klimate der Erde, etc., von Prof. W. J. van Bebber, 568
"Cloud-bursts" in Lakeland, 620
Clozel, M., au Congo (New Publications), 214
————, journey in French Congo region, 553
Coasts, morphology of, 318
Cochin, New Publications—
Report on Census of, 1891, by C. A. Menon, 329
Cocoa, New Publications—
History and Cultivation of cocoa tree, by "Historicus" [Cadbury], 571
Codrington, R., A visit to Lake Chiuta, British Central Africa, 183
Coffee-planting of the Shiré Highlands, 374, 385
Coghlan, T. A., Wealth and Progress of New South Wales (New Publications), 446
Cole, G. A. J., Open-Air Studies (New Publications), 567
Collie, D. K., Report on Governmental Maps for Schools (New Publications), 223
Collie, Dr. J. N., Climbing on the Nanga Parbat Range (New Publications), 441
Collignon, Dr., De l'Auvergne à l'Atlantique (New Publications), 327
Collingridge, G., The Discovery of Australia (New Publications), 446
Colomb, Vice-Admiral, The Manœuvring Powers of Steamships, etc. (New Publications), 340
Colombaroli, A., Sandeh vulgairement appelée Niam Niam (New Publications), 333
Colombia, New Publications—
Bureau of American Republics, Bulletin of, 681
Colonial Systems and Colonizing Peoples, M. Dubois on, Review by G. G. Chisholm, 193
Colorado Plateau, New Publications—
Ueber das Colorado-Plateau zum Grand Cañon, von Dr. Credner, 216
Colquhoun, A., on the Nicaragua Canal, 316
————, Lecture on Nicaragua and its Canal (New Publications), 335
————, The Key of the Pacific, the Nicaragua Canal (New Publications), 217
Columbretes, by H. I. H. Archduke Ludwig Salvator (New Publications), 108
Columbus, New Publications—
Authentic Letters of Columbus, by W. E. Curtis, 339
Columbus and Toscanelli, New Publications—
Eller frågan om prioriteten af idén . . . Indien, af E. Carlson, 568
Colvin, Sir A., Indian Frontiers and Indian Finance (New Publications), 111
Commerce and Deep Waterways, by Prof. L. M. Lewis (New Publications), 570
Commerce, Highways of, Trade Routes of Foreign Countries (New Publications), 570
Commerce in War, The Protection of our, by H. W. Wilson (New Publications), 340
Comoros Islands, fauna of, 284
Comyn, F., The Seamy Side of British Guiana (New Publications), 445
Cones, E., Expeditions of Z. M. Pike to Headwaters of the Mississippi, etc. (New Publications), 444
Confucius, Tomb of, In a Mule Litter to the, by A. Armstrong (New Publications), 440
Congo, French, geographical work in, 552
———, Miss Kingsley's travels in the, 95
——— Railway, progress of the, 553
——— State, districts of the, 203
————, explorations by officials of the, 203
Congo, New Maps—
Congo Français, par Hansen, 228
Carte . . . du Chemin de Fer du Congo, par A. J. Wauters, 342
Congo, New Publications—
Animaux domestiques au Congo, par E. Meuleman, 442
Bibliographie du Congo, 1880–95, par A. J. Wauters, 213
Climatologie du Congo, par Dr. A. Poskin, 332
Deux années . . . chez le sultan Rafaï, par Ch. de la Kéthulle, 331
Erforschung des Kongo-Systems, von Dr. Pahde, 113
Le Chemin de Fer du Congo, 563
Les districts de l'État, 213
M. Clozel au Congo, 214
Conradt, L., Das Hinterland der deutschen Kolonie Togo (New Publications), 443
Conrau, G., Ueber das Gebiet zwischen Mundame und Baliburg (New Publications), 332
Continental areas, evolution of, 231
Continents, New Publications—
Areal und mittlere Erhebung der Landflächen, von H. Wagner, 218
Conway, Sir Martin, proposed expedition to Spitzbergen, 555
————, Remarks on "First Crossing of the Southern Alps of New Zealand," 501
Cook, Capt., earliest monument to, 435
————, and his first voyage, etc., by Sir H. W. Norman (New Publications), 336
Cook, Mount, New Zealand, 486, 500
Cook, O. T., Third Report of New York State Colonization Society, 563
Coolgardie Gold Fields, Notes on the, by Dr. Chewings (New Publications), 682

Coolgardie Gold Fields, Map by A. J. Vogan (New Maps), 688
Cope, E. D., The Formulation of the Natural Sciences (New Publications), 685
Copernicus, New Publications—
Les découvertes geographiques de son temps, par M. A. Daubrée, 569
Copland river and valley, New Zealand, 489, 500
Copland-Crawford, Major, journey from the Niger Delta to the Benin river, 661
Coquilhat, Capt., monument to, 557
Corbett, Mr., and Lieut. Drummond, Photographs of Spitzbergen, 576
Corcelle, M., Grottes du Jura méridional (New Publications), 438
Cordier, H., Fragments d'une Histoire des Études Chinoises (New Publications), 338
————, In Memoriam: Charles Ploix (New Publications), 223
————, Notice sur H. C. Rawlinson (New Publications), 119
Coret, M., Sur un appareil hydraulique . . . de rotation de la Terre (New Publications), 219
Cornoide, La, by A. Sanchez (New Publications), 567
Cornu, A., Phénomènes . . . de l'atmosphere (New Publications), 568
Coronet, M. J., on Congo Railway works, 553
Corthell, E. L., The Tehuantepec Ship Railway (New Publications), 444
Cosa, Juan de la, Mapa-Mundi, por el Conde las Navas (New Publications), 683
Cosmogonique, Nouvelle théorie, par M. Duponchel (New Publications), 220
Costa Rica, New Publications—
Republic of, by J. B. Calvo, 681
Cotton-tail, Geographical distribution of the, etc., by O. Bangs (New Publications), 334
Coucheron-Aamot, W., 2500 kilometer opover Yangtse Kiang (New Publications), 111
Cowan, M. D., von A. Miessler (New Publications), 339
Cowper, H. S., Notes on a Journey in Tarhuna and Gharian, Tripoli, 150 *et seq.*
Crawford, J., Cerro Viejo and its Volcanic Cones (New Publications), 334
Credner, Prof., on the Evolution of the Baltic, 425
————, Ueber das Colorado-Plateau zum Grand Cañon (New Publications), 216
————, Ueber die Entstehung der Ostsee (New Publications), 220
Crevaux, Dr. Jules, expedition on the Pilcomayo, 83
Croglin Gorge, Lakeland, 610
Crowley's Ridge, Geographic Development of, by C. F. Marbut (New Publications), 333
Cruls, L., Commission d'Exploration du Plateau Central du Brésil (New Publications), 115
Crummock and Buttermere, origin of, 618
Cryptobronchus japonicus, 137
Cuinet's 'Turkey in Asia,' Review by G. G. Chrisholm, 281
Cundall, Fr., Jamaica in the Past and Present (New Publications), 335
Cuningham, G. C., A Scheme for Imperial Federation (New Publications), 223
Cunningham, D., The Estuary of the Tay (New Publications), 110
Currents, The Guinea and Equatorial, by J. Y. Buchanan, 267; *see also* 568
Currents, New Publications—
Courants . . . dans l'Atlantique nord, par M. Hautreux, 221, 568
Currents in the Red Sea, by Capt. Hood, 221
Guinea and Equatorial Currents, by J. Y. Buchanan, 568; *see also* 267
Les vents et les courants de la Mer, par Gén. Matthiesen, 220
Curtis, W. E., Authentic Letters of Columbus (New Publications), 339
————, Venezuela: her Government, etc. (New Publications), 445
Curzon, G. N., letter from, on the etymology of Makran, 557
Cushing, Dr., on the Sis Salwin States, 590
Cvijić, Dr., La grande grotte de Douboca (New Publications), 439
Cyrenaica, New Publications—
La Pentapole cyrénéene et la colonisation, par M. A. Rainaud, 113
Czink, Prof. Cherso, Isola nel Quarnero (New Publications). 560
Czirbusz, Prof. G., Das Jara-Thal und seine Bewohner (New Publications), 561

D.

D'Abreo, A., Discovery of the Moluccas, 365
Dadelszen, E. J. von, New Zealand Official Year-Book for 1895 (New Publications), 336
Daghestan, New Publications—
Der Nordfuss des Dagestan, von Dr. Radde und E. Koenig, 327
Dagomba territory, Niger Basin, 97
Dahomey et le Niger moyen au Sahara français, par le, by Captain Toutée (New Publications), 442
Dahomey, New Publications—
Dahome, land och folk, af A. H. de Pomian, 563
Dakar au Cap Juby (New Publications), 443
Dakar, Senegal, 314

D'Albaigne, F. et A., par Dr. Hamy (New Publications), 222
Dalgleish, Dr. W. S., Ashanti and the Gold Coast (New Publications), 215
Dall, W. H., "Jeannette Relics" (New Publications), 566
————, Alaska as it was and is, 1865–95 (New Publications), 333
D'Almeida, P. C., Gogol géographe (New Publications), 223
D'Almeida, M., La colonisation russe contemporaine le long de la Volga (New Publications), 109
Daly, C. P., Controversy between Venezuela and Great Britain (New Publications), 566
Damascus and Bagdad, New Maps—
Routenkarte einer Reise von Damaskus nach Bardâd, von Freiherr v. Oppenheim, 687
Damascus to Bagdad, Freiherr v. Oppenheim's journey from, 548, 658
Damköhler, E., Zur Sprachgrenze um Aschersleben (New Publications), 107
Dana, J. D., by H. S. Williams (New Publications), 222
Danger Islands, Antarctic, 627
Danube, The Ship Canal at the Iron Gates on the, 544
Danube, New Publications—
Die Donau als Völkerweg, von A. v. Schweiger-Lerchenfeld, 327
Donau-Studien, von Dr. J. v. Lorenz-Liburnau, 438
Felsen-Inschriften der Katarakte in der untern Donau, von M. Téglás, 107
D'Anville's boundaries in Guiana, 279
Darab, Persia, 26
Darfur, Borders of, MM. Nilis and de la Kéthulle's journeys on, 428
Daria-i-Nimak, Persia, 164, 166
Darkot pass, Hindu Kush, 91
Dasgirdun, height of, 166
Dasgirdun, Persia, 40
Dasht-i-Kavir, 34, 36, 165, 166
D'Attanoux, J. B., Tripoli et les voies commerciales du Soudan (New Publications), 333
Däubler, Dr., Acclimatisation und Physiologie der Tropenbewohner (New Publications), 339
Daun, Wadi, Tripoli, 156
Davey, R., Stamboul: Old and New (New Publications), 440
D'Avila, C., Dos nivelamentos de precisão e da sua superficie de referencia (New Publications), 117
Davis, Prof. W. M., on Local Maps in American Schools, 665
————, Letter from, on Theoretical Geography, 557
————, Quarries in the Lava Beds at Meriden (New Publications), 334
Dawson, Dr. G. M., Geographical Work of the Geological Survey of Canada in 1895..412
Dawson, Dr. G. M., Annual Report, Geological Survey of Canada (New Publications), 679
Dawson, W. B., Tides and Currents in Canadian Waters (New Publications), 679
Debo, Lake, Upper Niger, 98
Déboisement des montagnes, Des effets du, par M. Guénot (New Publications), 117
Deckert, Dr., Account of Projected Ship Canals in the United States, 553
———— —, Amerika, Eine allgemeine Landeskunde (New Publications), 215
————, Betrachtungen über Westindien (New Publications), 335
————, Ueber den stand der geographischen Forschung in Nord-Amerika (New Publications), 215
Décimal, Le temps, par M. de Rey-Pailhade (New Publications), 117
Deh Balla valley, Persia, 30
Dehérain et Demoussy, MM., Sur la circulation de l'air dans le sol (New Publications), 448
Delannoy, Ch., L'Angola et la colonisation portugaise (New Publications), 678
De Launay, M., L'île de Lemnos (New Publications), 109
Delaware-Chesapeake Canal, 554
Delaware river, New Publications—
Does the Delaware Water Gap consist of Two River Gorges? by E. Walter, 216
Delisle, Dr. F., La colonisation à Madagascar (New Publications), 679
De Magistris, L., Sul clima della Colonia Eritrea (New Publications), 214
Demanche, G., La France recule au Niger (New Publications), 333
D'Enjoy, P., Une incursion chez les Moï (New Publications), 111
D'Entrecasteaux, New Publications—
Collection de Dessins provenant de l'Expédition de, par Dr. E. T. Hamy, 568
Der, town of Syria, 549
Derby, Earl of, Canada (New Publications), 114
Descamps, Commandant, Au lac Moëro (New Publications), 213
Deserts, New Publications—
Dépressions et déserts, par A. de Lapparent, 117
Deserts, salt, of Persia, altitudes and climate of, 165–167
Devinka river, New Guinea, 432
Dezert, M. du, Mission en Espagne (New Publications), 328
Diagram for Determining the Parallaxes in Declination, etc., by Major S. Grant, 649
Diamanti, M., Le Transvaal, État politique, etc. (New Publications), 113
Diatom ooze of the Great Southern Ocean, 539
Dickinson, B. B., Geography as a School-subject (New Publications), 571

Dickson, H. N., The Movements of the Surface Waters of the North Sea, 255 *et seq.*
Diener, Dr., Die Eiszeit in Himalaya (New Publications), 441
———, Mittheilungen über eine Reise im Central-Himalaya von Kumaon, etc. (New Publications), 111
Diest und Anton, Neue Forschungen im nordwestlichen Kleinasien (New Publications), 329
———, Itinerar-Aufnahmen im nordwestlichen Kleinasien (New Maps), 226
Diller, J. S., Tertiary Revolution in the Topography of the Pacific Coast (New Publications), 216
Dinklage, L., Stromversetzungen vor der Bucht von Biscaya (New Publications), 326
Diurnal waves, origin of, 239
Dixon, G. G., note on the British Guiana and Venezuelan Boundary Frontier, 99
Doberck, Dr., How to manage ship in a typhoon (New Publications), 567
Dodd, J., Formosa (New Publications), 111
Doering, Premierlieutenant v., Reiseberichte von (New Publications), 332
Doga, Wadi, Tripoli, 151, 152
Domestication of Animals, by Ed. Hahn (New Publications), 338
Don, Dr. W. G., Archæological Notes on Early Scotland (New Publications), 561
Donaldson, C. W., The Cruise of the *Balæna* and *Active* in the Antarctic Seas, 625 *et seq.*
Donat, F. von, The Pontine Marshes (New Publications), 439
Dondin Island of Friar Odoric, identification of, 659
Dongola Expedition, Map to illustrate the, by W. and A. K. Johnston (New Maps), 573
Donnet, M., Les Anversois aux Canaries (New Publications), 112
Dordogne, New Publications—
Sur la mise en culture des terres de bruyères de la Dordogne, par M. Bouilhac, 107
Dortsman, Adriaan, Documenten betreffende de ontdekkingstochten van (New Publications), 683
Douboca, La grande grotte de, par Dr. Cvijić (New Publications), 439
Dowding, Capt., Map showing Surveys, etc., from Quito down the Rio Napo (New Maps), 121
Dozy, R., Vesperas do Centenario (New Publications), 439
Drake, Sir Francis (New Publications), 339
Drapeyron, L., Les Capitaine, gardiens du depôt . . . de Cassini (New Publications), 684
Dravidian races in Makran, 389, 390
Drift-dams in Lakeland, 619
Drygalski, Dr. E. v., Der gegenwärtige Standpunkt der Polarforschung (New Publications), 337
Dubois, M., on Colonial Systems and Colonizing Peoples, review by G. G. Chisholm, 193
Duffart, Ch., Les anciennes baies de la Gascogne (New Publications), 560
Du Fief, J., La zone polaire australe, etc. (New Publications), 682
Dufour, M. H., La recoloration des Alpes après le coucher du soleil (New Publications), 219
Dumble, E. T., The Soils of Texas (New Publications), 334
Dundee Island, Antarctic, 633, 635
Du Pasquier and Penck, Alter und die Verbreitung des Lösses (New Publications), 683
Duponchel, M., Nouvelle théorie Cosmogonique (New Publications), 220
———, La circulation des vents et de la pluie (New Publications), 118
Duro, D. C. F., Relación breve . . . viaje que hizo A. de Mendaña (New Publications), 680
Dusén, P., Om Kamerunområdet (New Publications), 443
Dutch boundary in Guiana, 278, 279
Dutch in Batak Land, The, 80, 81
Dutch East Indies, New Publications—
Dagh-Register . . . Nederlandts-India, van J. A. van der Chijs, 562
Nederlandsche-Indisch Plakaatboek, door J. A. van der Chijs, 212, 562
Dutreuil de Rhins and Grenard, MM., Mission . . . dans la Haute-Asie (New Publications), 329
Dyak (Dayak), The Name of, Mr. Ling Roth on the origin of, 432

E.

Eamont river, Lakeland, 615
Earth's Crust, Movements of the, by John Milne, 229 *et seq.*
Earthquakes, origin of, 235
Earthquakes, New Publications—
Internationalen Systems von Erdbeben-Stationen, von E. Rebeur-Paschwitz, 220
Ueber submarine Erdbeben, von E. Rudolph, 229
Earth-tremors, observations on, 244
Easter island, New Publications—
Die Zustände auf der Oster-Insel, von Dr. Polakowsky, 217
Ecuador, New Maps—
Map showing Captain Dowding's Surveys, etc., 121
Ecuador, New Publications—
Bureau of American Republics, Bulletin of, 681
Eden river-valley, 605
Edenside waterways, 607

Edrisi's account of Kais, 647
Educational Lectures by Mr. Mackinder, 91
Educational Prizes of the R.G.S., award of, 425, 544
Egli, J. J., Die Seele der geographische Namen (New Publications), 684
Egypt, New Publications—
Aegypten 1894, von A. von Fircks, 113
The Egypt of the Hebrews and Herodotus, by Rev. A. H. Sayce, 213
Egyptian, New Publications—
Die Wiedergeburt Aegyptens, etc., von Dr. Schweinfurth, 221
Ehlers, Otto E., Bangkok (New Publications), 678
Ehlers, Otto, death of, 102
———, last expedition in New Guinea, 431
———, Biography of, W. Wolkenhauer (New Publications), 569
Ehrenberg, C. G., by Dr. Günther (New Publications), 222
Eide, Færoes, 20
Eisen, G., Explorations in Cape Region of Baja California (New Publications), 679
Ekholm, N., Om vädertecksförhallandena . . . luftballong (New Publications), 567
Elastic Spheroid, Rotation of an, by S. S. Hough (New Publications), 683
Eldridge, G. H., A Geological Reconnaissance in North-West Wyoming (New Publications), 216
Eldslandet, by O. Nordenskjöld (New Publications), 445
Elephant hunting in Central Africa, 374
Elliot, G. F. Scott-, A Naturalist in Mid-Africa (New Publications), 331
———, Africa as a Field for Colonial Enterprise (New Publications), 112
———, Commercial Prospects of British Central and East Africa (New Publications), 678
Elliot, Mr. Scott-, Book on Mid-Africa, Note on, 660
Elsdale, Lieut.-Colonel, The Problem of the Races in Africa (New Publications), 678
England and France in the Nile Valley, by Capt. F. D. Lugard (New Publications), 214
England, New Publications—
The lost possessions of, by W. F. Lord, 685
England and Wales, New Maps—
Geological Survey of, 341
Ordnance Surveys, 120, 225, 341, 449, 572, 686
Relief Map of, Longmans & Co., 342
England and Wales, New Publications—
Comprehensive Gazetteer of, by J. H. Brabner, 110
England's History as Pictured by Famous Painters, by A. G. Temple (New Publications), 677
English Lakeland, The Waterways of, by J. E. Marr, 602 *et seq.*
English and German Dictionary, by Flügel, Schmidt, Tanger (New Publications), 571
English colonization, 194
English Topography, The Gentleman's Magazine Library, edited by F. A. Milne (New Publications), 110
Ennerdale Lake, 618
Equatorial and Guinea Currents, by J. Y. Buchanan, 267
Erbach-Erbach, Graf, Im Delta des Orinoko (New Publications), 566
Erde, Die, von Dr. F. Heiderich (New Publications), 684
Erdkruste, den Bau der, von A. Philippson (New Publications), 220
Erdmagnetismus und Erdgestalt, von Dr. A. Schmidt (New Publications), 338
Erfurt, New Publications—
Die Lagenverhältnisse von, von Dr. Kirchhoff, 107
Erg Region, M. Foureau's journey in the, 663
Erie and Ontario, New Publications—
Lakes Erie and Ontario, etc., Sailing Directions for, 680
Eritrea, New Maps—
Nuova Carta . . . nell' Eritrea e Regioni Limitrofe, 450
Eritrea, New Publications—
Sul clima della Colonia Eritrea, di L. de Magistris, 214
Les Colonies italiennes, par M. Brion, 214
Eskdale, stream diversions near, 619
Essequibo, New Publications—
Old Boundary of Essequibo, by J. Rodway, 565
Ethiopian Region of the Geography of Mammals, 282
———, boundaries, 283; mammal fauna of, 284; rodents, 285; antelopes, 285; carnivora, 285; insectivora, 286; subdivision, 286; past history of, 294
Ethnography of Caucasia, 547
Ethnology, by A. H. Keane (New Publications), 338; note on, 433
Etsch, Die, von A. Penck (New Publications), 109
Europe, New Publications—
Fagan om istidens . . . Europa, by A. G. Nathorst, 560
Sur le régime pluviométrique de l'Europe occidentale, par M. Angot, 110
European settlement in Central Africa, 378–380
Euting, Prof. Dr. J., von A. Miessler (New Publications), 569
Evaporation of the soil, 242, 243
Ewing, Rev. W., A Journey in the Hauran (New Publications), 213
Expérimentale à l'histoire orogenique de l'Europe, Essai d'application de la méthode, par S. Meunier (New Publications), 117

F.

Færoes, the, by Dr. K. Grossmann, 1 *et seq.*
————, general position and geological structure of, 2, 22; cliff scenery, 4; glacial action, 5; climate, 6; dress of the natives, 8; bird-catching, 19; literature, 21; volcanic history, 23
Færoes, New Publications—
Færøerne, 1600-1709, af N. Andersen, 327
Die Faerøer-Gruppe, von D. Broeker, 107
Fagalde, A., El Puerto de Talcahuano i sus obras de mejoramiento (New Publications), 115
Fahalfahra, ancient town of, 672
Fahraj, ancient town of, 670, 672, 674
Faquibine Lake, Upper Niger, 99
Far East, Problems of the, by Hon. G. Curzon (New Publications), 440
Farquharson, Col. J., Remarks on "Proposed Geographical Description of the British Islands," 357
Fassig, O. L., Report of International Meteorological Congress edited by (New Publications), 220
Fathura, sulphur springs at, 25
Faucilles, Les, par Dr. A. Fournier (New Publications), 327
Fault valleys of Lakeland, 611
Feilden, Col., Kolguev Island (New Publications), 439
Fergusson Island, Sir W. MacGregor's journey across, 432
Fernando Po Island, fauna of, 283
Fest, Prof. A., Roads from Hungary to Adriatic (New Publications), 561
Fewkes, J. W., A Comparison of Sia and Tusayan Snake Ceremonials (New Publications), 118
Fiji Islands, New Publications—
Bidrag till, Kännedomen om Fidjiöarnes . . . af Ernst Stenberg, 682
Filhol, M., on lectures to travellers, 320
————, Conseils aux voyageurs naturalistes (New Publications), 340
Finland, geography, etc., of, 199
Finland, New Publications—
Die Kulturentwickelung Finnlands, von N. V. Köppen, 109
Finmarken, New Publications—
Folk og natur i Finmarken, af H. Reusch, 328
Finsch, Dr. O., Charakteristik der Avifauna Neu-Seelands (New Publications), 446
Fiorini, M., Sopra tre speciali projezioni meridiane, etc. (New Publications), 119
Firabuz, Makran, 397
Fircks, A. von, Aegypten, 1894 (New Publications), 113
Fiscarrald, Señor, explorations on the Madre de Dios, 189
FitzGerald Pass, New Zealand Alps, 488
FitzGerald, E. A., The First Crossing of the Southern Alps of, 483 *et seq.*
Fitz Gerald, E. A., Photographs of the Southern Alps of New Zealand (New Maps), 576
————, Work in New Zealand (New Publications), 116
Fitz Roy, Admiral Sir R. O'Brien, Obituary of, 666
Flateyjarbok, Published by the Royal Danish General Staff (New Publications), 119
Floatsam and Jetsam from the Great Ocean, by Rev. J. B. Stair (New Publications), 218
Floquet et Sarranton, MM., L'heure décimale (New Publications), 447
Flügel-Schmidt-Tanger, Dictionary of English and German Languages (New Publications), 571
"Fog shaffer" in the Antarctic, 641
Fonck, F. Menendez, Travels in South America (New Publications), 681
Forel, F. A., La Commission internationale des glaciers (New Publications), 220
Forest, J., L'autruche de Barbarie (New Publications), 442
Formosa, by John Dodd (New Publications), 111
Formosa, New Publications—
Die Bevölkerung Formosa, von H. Panckow, 330
Förster, B., Ueberblick über die Niger-Expeditionen, etc., 1895 (New Publications), 114
Fort Stedman, Shan States, 580
Foulon, M., L'Islande (New Publications), 676
Foureau, M., Journey in the Erg region, 663
Fournereau, L., Le Siam Ancien, Archéologie—Epigraphie—Géographie (New Publications), 112
Fournier, M. E., Sur la géologie du Caucase central (New Publications), 327
Fournier, Dr. A., Les Faucilles (New Publications), 327
Fox Glacier, New Zealand Alps, 494, 501
France, New Publications—
La situation démographique de la France en Europe, par Dr. Chervin, 327
Francisco, Rio S., A navegação dos affluentes do (New Publications), 115
Frankincense and Myrrh, The Land of, by J. T. Bent (New Publications), 110
Franklin, Life of Sir J., by H. D. Traill (New Publications), 569
Franz Josef Glacier, New Zealand Alps, 495
Franz Josef Land, Letter from J. von Payer on his map of, 105
Fraser, M. A., Western Australian Year-Book for 1893-94 (New Publications), 116
"Freeland" Colony, New Publications—
Colonisations project der Freiländer, von R. H. Schmitt, 571

French attempts to ascend the Mekong, 200
French claims in Siam, 298
French colonization, 194
French Congo, geographical work in, 552
French Explorations in the Timbuktu Region, 98
French Literature, New Publications—
Catalogue . . . Librairie Française, 570
French Progress in the Western Sudan, by Captain Pasfield Oliver (New Publications), 214
French West Africa: *see* Africa
Frers, Dr. E., Provincia de Buenos Aires, Memoria por (New Publications), 334
Freshfield, D. W., on the Caucasian travels of Dr. Abich, 656
Friederichsen, L., Der Sechste Internationale Geographen-Kongress in London (New Publications), 224
Fritsch, Prof. G., von A. Miessler (New Publications), 569
Fritsche, Dr., Ueber den . . . Erdmagnetischen Horizontal-intensität (New Publications), 219
Frye, A. E., Complete Geography (New Publications), 571
Fuji volcano, Japan, 149
Fulton, R. L., How Nature regulates Rains (New Publications), 683
Fuss, Müller, und Jürgens, Beobachtungen der Russischen Polarstation an der Lenamündung (New Publications), 112

G.

Gabb, W. M., Informe sobre la Exploracion de Talamanca (New Publications), 217
Gain, E., Mission scientifique en Algérie et en Tunisie (New Publications), 331
Gain, M., on the Influence of Drought on Vegetation in Algeria and Tunis, 430
Galle, Dr. A., Hohenbestimmungen im Riesengebirge (New Publications), 676
Gambia, New Publications—
La Flore utile du Bassin de la Gambie, par Dr. A. Rançon, 564
Game, Big, of South Africa (New Publications), 332
——, Wild, In haunts of, by F. V. Kirby (New Publications), 332
Gammie and Woodrow, Messrs., Records of the Botanical Survey of India (New Publications), 329
Ganeval et Groffier, MM., Dictionnaire de Géographie Commerciale (New Publications), 338
Gannett, H., Indian Territory (New Publications), 216, 444
——, Survey and Subdivision of Indian Territory (New Publications), 565
Garde, Th. V., Un été au Grœnland (New Publications), 117
Garhwal, New Publications—
Great Landslip at Gohna, in Garhwal, by J. H. Class, 677
Garing Cho lake, Tibet, 466
Garmab, Persia, 36
Garrard, J., Map of Zululand, showing positions of Gold and Coal Fields, etc. (New Maps), 121
Gascony, New Publications—
Les anciennes baies de la côte de Gascogne, by Ch. Duffart, 560
Gau-Khane, Persia, 169
Gautier, M., Au dela du Jourdan (New Publications), 112
——, Mars et la Terre (New Publications), 224
Gavazzi, Dr., Ein Beitrag zur Hydrologie der unteren Krka (New Publications), 106
Gazetteer of the Rawalpindi District (New Publications), 441
Gazetteers, Recent, Notes on, 415
Gazetteers, New Publications—
Nouveau Dictionnaire de Géographie Universelle, par L. Rousselet, 684
Ritters geographisch-statistisches Lexikon, von J. Penzler, 684
Gebauer, H., Die Waldungen des Königreichs Sachsen (New Publications), 328
Gebelin, J., Une grande industrie du Bas-Quercy (New Publications), 107
Geikie, Prof. J., remarks on rock specimens from the Antarctic, 517
Geikie, Sir A., communication on "The Færoes," 22
——, remarks on "Movements of the Earth's Crust," 247
Geistbeck, Dr. A., Die bayerische Pfalz (New Publications), 676
Gemengde Diluvium, Bijdrage tot de Kennis van het, door Dr. H. van Cappelle (New Publications), 683
Gennep, J. van, Bijdrage tot de Kennis van den Kangéan-Archipel (New Publications), 441
Gentleman's Magazine Library, English Topography, by F. A. Milne (New Publications), 110
Geodesy, New Publications—
Die Norwegische Commission der Europäischen Gradmessung, 109
Jahresbericht des Direktors des Königlichen Geodätischen Instituts, 107
L'attrazione locale nella Specola geodetica, nota di V. Reina, 219
Publicationen für die Internationale Erdmessung, von Prof. E. Weiss und Dr. R. Schram, 682
Veröffentlichung des Königl. Preussischen Geodätischen Institutes, 218
Geographic Development of Crowley's Ridge, by C. F. Marbut (New Publications), 333
Geographical Association, progress of the, 664
Geographical Association, New Publications—
Catalogue of Slides, 571
Geographical Bibliographies, Recent, by Dr. H. R. Mill, 72

Geographical Congress, New Publications—
Der Sechste Internationale Geographen-Kongress in London, von L. Friederichsen, 224
Der sechste internationale geographische Congress zu London, par P. Paulitschke, 685
VI. Congresso Geografico Internazionale, by Prof. Giglioli, 340
VI. Congresso Geografico Internazionale di Londra, by Prof. Ricchieri, 341
Geographical Description, Proposed, of the British Islands, by Dr. H. R. Mill, 345 *et seq.*
Geographical Description of the British Islands, Ideas for, 348; Chief Sources of Information, 349; Plan of the Memoir, 350; Method of Execution, 352; Probable Magnitude, etc., of the Work, 354; Discussion on, 356
Geographical Exhibition, New Publications—
Geographische Ausstellung . . . in London, von H. Michow, 684
Geographical Institute, Military, in Vienna, 91
Geographical Literature of the Month—
Africa, 112, 213, 331, 442, 563, 678
America, 114, 215–217, 333, 444, 564, 679
Anthropo-Geography and History, 118, 221, 338, 568, 683
Asia, 110, 212, 329, 440, 562, 677
Australasia and Pacific Islands, 116, 217, 335, 336, 446, 566, 682
Biography, 119, 222, 339, 449, 569, 684
Europe, 106, 211, 326, 438, 560, 676
General, 119, 223, 340, 569, 684
Mathematical Geography, 117, 218, 447, 567, 682
Physical and Biological Geography, 117, 219, 338, 448, 567, 683
Polar Regions, 117, 337, 447, 566, 682
Geographical Methods, Prof. L. Neumann on, 665
Geographical Monographs, American, 319
Geographical Names, New Publications—
Die Seele der geographische Namen, von J. J. Egli, 684
Geographical Work, The Use of Balloons in, by A. Berson, 541: *see also* 448
Geographical Work of the Geological Survey of Canada in 1895, by Dr. G. Dawson, 412
Géographie Historique, Atlas de, by F. Schrader (New Maps), 228, 574
Geographie Universelle, New Publications—
Nouveau Dictionnaire de, par L. Rousselet, 684: *see also* 415
Geographie und Höhlenkunde, von F. Kraus (New Publications), 221
Geographisches aus dem Luftballon, von A. Berson (New Publications), 448: *see also* 541
Geographisches Jahrbuch, von H. Wagner (New Publications), 340
Geography—
And Resources of British Central Africa, by A. Sharpe, 366 *et seq.*
As a Science, Dr. H. R. Mill on, 345–347
Classification of, 665
Conference of, at Chicago, Reports of the Committee, by I. C. Russell, 434
Dictionary of, by MM. V. de Saint-Martin and Rousselet, note on, 415: *see also* 684
In Secondary Schools, 208
Lectures on, by Mr. Mackinder, 91
Of Mammals, No. IV., by W. L. Sclater, 282 *et seq.*, 435
Popular University Courses in Vienna on, 91
Theoretical, letter from Prof. W. M. Davis on, 557
Geography, New Publications—
Complete Geography, by A. E. Frye, 571
Conférence sur l'importance de la Géographie, etc., par Général Annenkoff, 119
Cours de Géographie, par J. Molard, 224
Der erdkundliche Unterricht, von Dr. Langenbeck, 223
Dictionnaire de Géographie Commerciale, par MM. Ganeval et Groffier, 338
Die methodischen Fragen in der Geographie, von Prof. Neumann, 340
Elementary Physical Geography, by R. S. Tarr, 118
First lessons in geography, by T. S. Steinhauer, 224
Geography as a Science in England, by Dr. H. R. Mill, 340
Geography as a School-subject, by B. B. Dickinson, 571
Geography of Mammals, by W. L. Sclater, 568
Gogol géographe, par P. d'Almeida, 223
Grundzüge der physischen Erdkunde, von Dr. Supan, 221
Le principe de la géographie générale, par M. V. de la Blache, 340
"Politischen Geographie" im Schulunterricht, von A Kirchhoff, 223
Standpunkt der Physische Geographie, door J. Timmerman, 683
The Child's First Book of, Longmans' Geographical Series, 571
Versichten der Wirtschaftgeographie, von A. Oppel, 683
Geological Explorations in South Australia, 554
Geological Literature added to the Geological Society's Library (New Publications), 570
Geological Survey of Canada, Geographical Work of the, in 1895, by Dr. Dawson, 412
————————————, List of Publications of (New Publications), 333

Geological Survey of England and Wales (New Maps), 341
Geologische Klimate, von Dr. Woeikow (New Publications), 117
Geology of Arctic Europe and its Islands, Part I. Kolguev Island, by Col. Feilden (New Publications), 439
Geology, New Publications—
Open-Air Studies, by G. A. J. Cole, 567
Georgina Basin, Stratigraphical Notes on the, etc., by R. L. Jack (New Publications), 446
Gerbing, L., Ausrottung der Raubtiere im Thuringia (New Publications), 676
Gerez, Promenade au, par P. Choffat (New Publications), 439
Germain, A., Projet d'une carte de la terre au 1 : 1,000,000 (New Publications), 117
German Africa: *see* Africa
German Barrier across Africa, The Proposed, by Dr. J. W. Gregory (New Publications), 332
German Colonies, New Maps—
Kleiner Deutscher Kolonialatlas, 574
German Colonies, New Publications—
Beiträge zur Kenntnis der Deutschen Schutzgebiete, von P. Langhans, 217
Weissbuch, 442
Germany, New Maps—
Fremde Volksstämme in Deutschen Reiche, von P. Langhans, 225
Geologische Karte des Deutschen Reichs, von Dr. Lepsius, 225, 686
Germany, New Publications—
Ergebnisse der Niederschlags-Beobachtungen im Jahre 1893..108
Ergebnisse der Gewitter-Beobachtungen im Jahre 1891, von Dr. Assmann, 108
Fremde Volksstämme im Deutschen Reich, von P. Langhans, 108
Jahresbericht des Direktors des Königlichen Geodätischen Instituts, 107
Laubwaldflora Norddeutschlands, von Dr. Hock, 327
Niederschläge im nordwestlichen Deutschland, von Dr. Moldenhauer 439
Volksgrenzen in Ost und West, von Dr. Kossina, 561
Ghan, Wadi el, Tripoli, 160
Gharian, Tripoli, 158 *et seq.*
Ghubra el Tam, 529
Gibbons, Capt., explorations in the Barotse country, 662
Giglioli, Prof., Il VI. Congresso Geografico Internazionale (New Publications), 340
Gilbert, G. K., The Origin of Hypothesis (New Publications), 684
Gill, Dr. David (New Publications), 339
Gilles, M., Le bassin houiller du Nord (New Publications), 438
Gillett, F., Photographs of Somaliland (New Maps), 452
Girard, J., Les phénomènes eruptifs sous-marins (New Publications), 568
Glacial striæ in the Canadian Rockies, 55
Glaciation and Lake-Basins of Subalpine Switzerland, Dr. du Riche Preller on, 655
Glaciation of the Færoes, 6
Glaciers, New Publications—
De la coexistance . . . de deux systèmes de plis conjugués, de M. Haug, 220
Glaciers et période glaciaire, par L. du Pasquier, 567
Influence of débris on the flow of glaciers, by I. C. Russell, 220
Karstformen der Gletscher, von Dr. Sieger, 220
La Commission internationale des glaciers, de M. Forel, 220
Les dépôts glaciaires etc., par MM. Kilian et Penck, 220
Glaisher, Jas., balloon observations, 542, 543
Glaser on the Abyssinians, Review, 420
Glass, J. H., The Great Landslip at Garhwal (New Publications), 677
Glenderamackin Beck, 610
Globe terrestre à l'échelle du Centmillième, Projet de construction d'un, par E. Réclus (New Publications), 117
Globe verrazanien, Un nouveau, par H. Harrisse (New Publications), 222
Globes, Eight small historical, etc., by G. Philip and Son (New Maps), 343
Globigerina ooze of the Great Southern Ocean, 539
Goddard, Mount, and its Vicinity, by J. S. Solomons (New Publications), 444
Godfrey-Faussett, Lieut., Note to Sketch-Map of the Upper Kuyuni, 541
Gogol géographe, par P. C. d'Almeida (New Publications), 223
Goitre in Yarkand, 456
Gold and Silver and the Money of the World, by L. C. Probyn (New Publications), 340
Gold Coast, New Publications—
Further Correspondence relating to Affairs in Ashanti, 442
History of Gold Coast and Asante, by Rev. C. C. Reindorf, 564
Studien von Goldküste, von Dr. E. Mähly, 114
Goldie, Sir G., remarks on the death of Mr. Seebohm, 211
Goldman, S., Map of the Witwatersrand (New Maps), 121
Goldziher und Landberg-Hallberger, Drs., Die Legende vom Barsîsâ (New Publications), 340
Gordon and Gotch, The Australian Handbook (New Publications), 682
Gore, F. St. J., Hill Life in the Afghan and Hindu Highlands, etc. (New Publications), 330
Gorges, Post-Glacial, formation of, 620
Goring La, Tibet, 469
Goshen, New Publications—
Hvor laa det gamle Gosen? af Prof. Vald. Schmidt, 563

Gotländ, New Publications—
Studier öfver den Gotländska vegetationens, af. R. Sernander, 328
Götzen, Graf von, book on Africa, review of, 273
————————, Der Afrikareisende (New Publications), 222
————————, Durch Afrika von Ost nach West (New Publications), 442
————————, La traversée de l'Afrique centrale (New Publications), 331
————————, Reiseweg . . . in Deutsch-Ostafrika (New Maps), 450
Gouffre de Pierrefeu, exploration du, par M. Chevrot (New Publications), 438
Governmental Maps for use in Schools, Report on, by D. K. Collie (New Publications), 223
Gowen, H. H., Sketches of Hawaiian Scenery and Life (New Publications), 566
Gowland, Mr., remarks on "Exploration in the Japanese Alps," 146
————————, visit to the Japanese Alps, 125
Grabowsky, F., Der Bezirk von Hatzfeldthafen (New Publications), 218
Graetz, Prof. H., History of the Jews (New Publications), 339
Graham's Land, Antarctic, 508
Granatspitzgruppe in den Hohen Tauern, von M. v. Prielmayer (New Publications), 106
Grant, Major S., Diagrams for determining the Parallaxes in Declination, etc., 649
Grasmon, "cloud-burst" on, 620
Gravier, G., Ferd. de Lesseps (New Publications), 339
Gravity Determinations, New Publications—
Relative Schwerebestimmungen, von R. v. Sterneck, 219
Gray, J. A., At the Court of the Amír (New Publications), 212
Great Bank of Newfoundland, The, 316
Great Lakes and Niagara, Dr. Spencer's studies on the, 204
Great Southern Ocean, extent and climate of, 538, 539
Greece, New Maps—
Vegetations-Karte des Peloponnes, von Dr. Philippson, 226
Greece, New Publications—
Meteorologische und Magnetische Beobachtungen in Griechenland, von H. Hartl, 108
Reisen . . . in Nord-Griechenland, von Dr. Philippson, 439
Greek Bibliography, by Sakkelionos (New Publications), 223
Greely, General A. W., Handbook of Arctic Discoveries (New Publications), 566
————————, Nansen's Polar Expedition (New Publications), 567
————————, Scope and Value of Arctic Exploration (New Publications), 447
Greely, General A. W., The Present State of the Nicaragua Canal (New Publications), 445
Green Mountains in Massachusetts, Geology of the, by Rumpelly, Wolff, and Dale (New Publications), 216
Green, Rev. W. S., remarks on "First Crossing of the Southern Alps of New Zealand," 500
Greenland, New Publications—
Det Arktiske problem og de to Peary—expeditioner, by E. Astrup, 117
Un été au Grœnland, by M. Garde, 117
Gregory, A. C., Geographical History of Australia (New Publications), 682
Gregory, Dr. J. W., Proposed German Barrier across Africa (New Publications), 332
Greim, Dr., Die Fortschritte der Limnologie (New Publications), 118
Grevé, C., Geographische Verbreitung der jetzt lebenden Raubthiere (New Publications), 448
Greville, Hon. Ed., The Year-Book of Australia for 1895 (New Publications), 116
Griffin, Sir L., Kashmir (New Publications), 111
Grindrod, Mrs., Siam: a geographical summary (New Publications), 213
Griswold, L. S., Origin of the Lower Mississippi (New Publications), 334
Groller, M., Die Inselgruppe Pelagosa (New Publications), 326
Groneman, J., De Garêbêg's te Ngajogyâkartâ (New Publications), 212
Grossmann, Dr. K., The Færoes, 1 *et seq.*
Grulich, O., Katalogue der Deutschen Academie der Naturforscher (New Publications), 570
Grum Grjimailo, M. M., journeys in the Eastern Tian Shan, 656
Gruner, Dr. Hans (New Publications), 339
————————, Expedition in the Niger Basin, 96
Gruner, Döring, Dr., and Lieut. v. Carnap, Expedition des Deutschen Togo Komitee's (New Maps), 451
Guatemala, New Publications—
Bureau of American Republics, Bulletin of, 681
Guatós, Tres semanas entre los, por J. Koslowsky (New Publications), 445
Guénot, M., Des effets de Déboisement des montagnes (New Publications), 117
Gugird, or Sulphur hills, Persia, 168
Guiana Maps, 277
Guinea and Equatorial Currents, by J. Y. Buchanan, 267
Guinea en Equatorial Stroomen (von K. Nederlandsch Met. Inst.) (New Maps), 452
Gujarát, New Publications—
The Province of, by A. Rogers, 677
Gulf Stream, New Maps—
Temperaturen in Gulf von Mexico und in Golfstrom, von A. Lindenkohl, 452

Gulf Stream, New Publications—
Resultate der Temperatur . . . des Golfstroms, von A. Lindenkohl, 448
Günther, Dr., C. G. Ehrenberg (New Publications), 222
Günther, Prof. O., Die Deutsche Hansa (New Publications), 568
Günther, R. T., on organisms of marine type in Lake Tanganyika, 663
Gur-i-Bahram, Persia, 173
Güttner, Herr, on the geographical homologies of coasts, 318
Guyou, E., Problemes de navigation et la carte marine (New Publications), 337

H.

Habasat, or Habis, 420
Hacquart, R., De Marseille à Ségou-Sikoro (New Publications), 214
Haddington, Mount, Antarctic, 628
Haddon, Prof. A. C., Life and Industries in Ireland (New Publications), 561
Haera, Wadi, red iron deposit of, 162
Hahn, Ed., Die Haustiere . . . zur Wirtschaft des Menschen (New Publications), 338
Haig, Major-General, Letter from, on Ancient and Mediæval Makran, 668
Hail el Ghâi, 534, 535
Haitâ, New Publications—
Bureau of American Republics, Bulletin of, 681
Halbfass, Dr., Die Seenforschung in Italien (New Publications), 108
————, observations on the Lakes in the Basin of the Lech, 198
Haldensee, depth, etc., of, 199
Halley's Earliest Equal Variation Chart, by L. A. Bauer (New Publications), 449
Hallig Islands, the Protection of the, 544
Hallowi, Jebel, 527
Halwun, Persia, 39
Hamberg, A., En resa till norra Ishafvet (New Publications), 447
Hamburg, New Publications—
Historische Topographie der Freien und Hansestadt, von W. Melhop, 560
Hammer, Prof., Bemerkung über das "Areal eines Landes" (New Publications), 218
Hammer-Purgstall's account of Kais, 649
Hamy, Dr. E. T., Collection de Dessins de d'Entrecasteaux (New Publications), 568
————, Considérations générales sur les Races Jaunes (New Publications), 221
————, F. et A. d'Albaigne (New Publications), 222
————, Les Français au Spitzberg (New Publications), 561
————, Les imitateurs d'Alexander Brunias, etc. (New Publications), 569
Hann, Prof., on Mean Atmospheric Temperature in the Southern Hemisphere, 556
Hansa, Die Deutsche, von Prof. Günther (New Publications), 567
Hansen, M., Congo Français (New Maps), 228
Harinoki-toge pass, Japanese Alps, 128
Harira ruins, Persian Gulf, 644
Harra, or stony desert, 549
Harris, Col. J., Lecture on New British Route to Pacific (New Publications), 564
Harris, F. R., The Fate of South Africa (New Publications), 443
Harris, W. B., An unbiassed view of the Armenian Question (New Publications), 112
————, Tafilet (New Publications), 214; note on, 274
Harrisse, H., Un nouveau globe verrazanien (New Publications), 222
Hartl, H., Meteorologische und Magnetische Beobachtungen in Griechenland (New Publications), 108
————, Tafeln . . . Meridian und Parallelkreis-Bögen (New Publications), 218
Hassert, Dr., Die natürlichen und politischen Grenzen von Montenegro (New Publications), 109
Hatat, Wadi, 536, 537
Hatzfeldthafen, Der Bezirk von, von F. Grabowsky (New Publications), 218
Haug, M., Contribution . . . lignes directrices de la chaîne des Alps (New Publications), 326
Haug, E., De la coexistance . . . de deux systèma de plis conjugués (New Publications), 220
Haughton, Rev. S., On the Tides of the Arctic Seas (New Publications), 337
Haupt, Lewis M., Commerce and Deep Waterways (New Publications), 570
Hauran, New Publications—
A Journey in the, by Rev. W. Ewing, 213
Hausaland, by C. H. Robinson (New Publications), 215, 443
Haustiere . . . zur Wirtschaft des Menschen, von E. Hahn (New Publications), 338
Hauthal, R., Primera ascension al Nevado Colorado de Famatina (New Publications), 445
Hautreux, M., Courants dans l'Atlantique nord (New Publications), 221, 568
Hauttecœur, H., Andros (New Publications), 108
————, Le rocher de la Belle Hélène (New Publications), 676
Haviland, Dr., expedition to Mount Kinabalu, 430
Hawaii, New Publications—
Constitutional History of, by H. E. Chambers, 446
Hauz-i-Sultan-Kavir, Persia, 165
Sketches of Hawaiian Scenery and Life, by Rev. H. H. Gowen, 566
Heatley, J., The Port of the Upper Nile, etc. (New Publications), 113

Heawood, E., Recent African Books, 270
Heber, Bishop, by Dr. G. Smith (New Publications), 119
Hedin, Dr. Sven, journeys in Central Asia, 195
———————, Reise durch die Takla-Makan-Wüste (New Publications), 110
Hedley, C., Surviving Refugees . . . of Ancient Antarctic Life (New Publications), 337
Heiderich, Dr. F., Die Erde (New Publications), 684
Heimbrod, G., Application of Photography to Topographic Surveying (New Publications), 567
Heintze, W., Eisenbahnen in der Türkei (New Publications), 440
Hellenische Kolonisation, von G. Lachenmaier (New Publications), 568
Hemisphere, Southern, Mean Atmospheric Temperature in the, Prof. Hann on, 556
Hemsley, Prof. W. B., Some Curious Facts in Plant Distribution (New Publications), 338
Hendren, S. R., Government, etc., of the Virginia Indians (New Publications), 334
Herat-i-Kharab, Persia, 27
Hergesell, H., Beobachtungen . . . der Temperatur im Weissen See bei Urbeis (New Publications), 338
Herr und Tinter, Drs., Astronomische arbeiten der Oesterrichischen Gradmessungs-Commission (New Publications), 106
Herrich, A., Wandkarte des Weltverkehrs (New Publications), 574
Herrle, G., The Submarine Cables of the World (New Publications), 685
Hertslet, Sir E., Collection of Treaties . . . between Great Britain and Foreign Powers (New Publications), 571
Hetherington, Miss, Index to the Periodicals of 1894 (New Publications), 223
Hettner, A., Die Lage der Menschlichen Ansiedelungen (New Publications), 118
Heuman, E., Om Santalfolket och dess nuvarande hemland (New Publications), 563
Heure décimale, par MM. Floquet et Sarranton (New Publications), 447
Hevesi, L., Lebensbild eines Afrikaforschers (New Publications), 569
Heyerdahl, T., "Kane's" Reise langs Spitsbergens vestkyst (New Publications), 117
Hierapolis, Asia Minor, 191
High Cup Gill, Lakeland, 608
High Level Meteorological Station in the Balkan Peninsula, 544
Highways of Commerce, Trade Routes of Foreign Countries (New Publications), 570
Hill, Gray, A Journey East of the Jordan and the Dead Sea (New Publications), 442
Hill, H., Ruapehu, Retrospect and Prospect (New Publications), 116
Hill, R. T., The Panama Canal Route (New Publications), 445
Himalaya, New Publications—
An Artist in the Himalayas, by A. D. McCormick, 441
Die Eiszeit im Himalaya, von Dr. Diener, 441
Reise im Central-Himalaya von Kumaon, etc., by Dr. Diener, 111
Himeria, Rev. de, Padroado de Portugal em Africa (New Publications), 443
Hindu Kush, The Origin of the Kafirs of the, by Col. Holdich, 42 *et seq.*
Hirayu hot springs, Japan, 148
Hirschfeld, G., von H. Prutz (New Publications), 222
Hirt, Dr., Die Urheimat und die Wanderungen der Indogermanen (New Publications), 339
Hirth, F., Chao Ju-kua (New Publications), 339
Hirth, Prof., Zwei Jahre am Yangtze-Kiang (New Publications), 329
Historical Geography, Atlas of, by F. Schrader (New Maps), 228, 574
Hjort, J., Hydrografisk-biologiske studier over norske fiskerier (New Publications), 221
Hock, Dr., Laubwaldflora Norddeutschlands (New Publications), 327
Hodakayama, Japanese Alps, 127, 128
Hofra-en-Nahas copper-mines, 429
Hogböm, A. G., Genombrottsdalar i vart lands (New Publications), 561
Holdich, Col., Notes on Ancient and Mediæval Makran, 387 *et seq.*
———————, Notes on Ancient and Mediæval Makran (New Publications), 677
———————, on the Pamir Boundary Commission, 91, 92
———————, Preliminary Report . . . in connection with the Pamir Boundary Delimitation (New Publications), 441
———————, The Origin of the Kafirs of the Hindu Kush, 42 *et seq.*
Holub, Dr. E., Südafrikanische Ausstellung (New Maps), 124
Hölzel, Herr H., death of, 209
Honduras, New Publications—
Bureau of American Republics, Bulletin of, 681
Hood, Capt., Currents in the Red Sea (New Publications), 221
Hopfensee, depth, etc., of, 199
Hopkins, W., on the radial stream system of Lakeland, 603
Horizontalpendel-Beobachtungen, von Dr. Rebeur-Paschwitz (New Publications), 219
Horizontal pendulums, movements of, 251–255
Hormuz, Persia, 25
Horn, W. A., Scientific Exploration of Central Australia (New Publications), 446

Horne, J. T., Scheme for the triangulation of South Africa, 414
Hough, G. S., Rotation of Elastic Spheroid (New Publications), 683
Howgill fells, 606, 607
Howorth, Sir H., Remarks on "A Journey across Tibet," 481
Hözel, E., Spezialkärtchen in unseren Schulatlanten (New Publications), 684
Hrnun river, Batak Land, 77
Hubbard, Hon. G., Russia in Europe (New Publications), 439
Hudleston, W. H., Notes on Indian Geology (New Publications), 563
Hudson Bay, New Publications—
  Proofs of Rising of Land around, by R. Bell, 564
Hügel, Baron A. von, The Land of the Bataks, 75, 175
———— ————, The Land of the Bataks (New Publications), 563
Hukong river and valley, 93
Hull, Prof. E., On the Physical Conditions of the Mediterranean Basin, etc. (New Publications), 108
Hungary, New Publications—
  Roads from Hungary to Adriatic, by Prof. Fest, 561
Huron, Lake, New Publications—
  Sailing Directions for, 216
Husen-Nun, Persia, 163
Husmann, E., Die Reiskultur in Italien (New Publications), 108
Huygens, C., Lettres de, à Descartes, par C. et H. Adam (New Publications), 222
Huzuls, New Publications—
  Ethnologie . . . der Huzulen, von Dr. Kaindl, 439
Hypothesis, The Origin of, by G. K. Gilbert (New Publications), 684

I.

Ibn Haukal's account of Makran, 395
Ibn Moujávir, on the island of Kais, 646
Icebergs in the Antarctic, 627
Ice Fiord, Spitzbergen, Sir Martin Conway's proposed expedition to, 555
Ice in the Antarctic, 510, 511
Ice, New Publications—
  Experiments in Ice Motion, by E. C. Case, 338
  Growth, etc., of, by P. Vedel, 224
  Ice-Work, Present and Past, by T. G. Bonney, 567
  Isforholdene i Nordhavet, af C. Ryder, 447
Iceland, New Maps—
  Geologische Karte des südöstlichen Island, von Th. Thoroddsen, 226
Iceland, New Publications—
  Fra det nordostlige Island, by Dr. Thoroddsen, 561
  L'Islande, par M. Foulon, 676
Immanuel, Hauptmann, Die Amurprovinz (New Publications), 213
Imperial Federation, A Scheme for, by G. C. Cuningham (New Publications), 223
Inambari river, 187, 188
Inambari, De Riberalta al, by Dr. R. Paz (New Publications), 217
India and Afghanistan, frontier agreement between, 546
India, New Publications—
  Botanical Survey of, by Gammie and Woodrow, 329
  Census of, 1891, Report, etc., by Lieut.-Col. Abbott, 329
  Notes on Indian Geology, by W. H. Hudleston, 563
  Report on Administration of North-West Provinces and Oudh, 677
  Report on Census Operations, 562
  Return of Wrecks and Casualties in Indian Waters, 1894, by H. A. Street, 678
  Six Tactical Problems, etc., by Lieut. Col. Neville, 440
  Survey of India Department, General Report, 330
  Tobacco Industry of India and the Far East, by C. Tripp, 562
  Topography, etc., of Northern India, by H. M. Wilson, 440
India and China, New Publications—
  Treaty Series, Convention between Great Britain and China, etc., relative to Burmah and Tibet, 111
Indian Frontiers and Indian Finance, by Sir A. Colvin (New Publications), 111
Indian Government Surveys (New Maps), 226, 572
Indian North-East Frontier, Expedition on the, 93
Indian Ocean, fauna of islands of the, 283
Indian Territory, by H. Gannett (New Publications), 216, 444
Indo-China and Siam, Boundary Treaties in, 297
————, Prince Henry of Orleans' journeys in, 93
Indogermanen, Die Urheimat und die Wanderungen der, von Dr. Hirt (New Publications), 339
Indus channel, general direction of, 394
Inle lake, Shan States, 579, 580, 585
Insectivora of the Ethiopian Region, 286, 288
Intha tribe, Shan States, 579, 580
Irawadi, source of the, 199, 200
Ireland, New Publications—
  Peasant Life and Industries in, by Prof. Haddon, 56
Iron Gates on the Danube, Ship Canal at, 544
Isfahan, height of, 168
Italian discovery of the Moluccas, 366
Italy, New Publications—
  L'Aspect physique de l'Italie, par C. Pomba, 108
  Reiskultur in Italien, von E. Husmann, 108

Italy, New Publications—*continued*.
Seenforschung in Italien, von Dr. Halbfass, 108
Itawa country, Central Africa, 372
Ivanoff, Lieut., explorations of Siberian rivers, 545
Ivens, Dr. L'Afrique australe et la colonization néerlandaise (New Publications), 215
Ivory Trade in 1895..435
Iwanowski, Dr., Die Mongolei. Ethnographical Skizze (New Publications), 111

J.

Jack, R. L., Stratigraphical Notes on the Georgina Basin, etc. (New Publications), 446
Jackson, Dr. S., Arctic Cruise of the *Bear* (New Publications), 447
Jade trade in Khotan, 456
Jamaica, New Publications—
A West-Indian Island, by Sir H. W. Norman, 335
Handbook of Jamaica for 1896, by Musson and Roxburgh, 566
Jamaica, by Fr. Cundall, 335
Journal of Institute of, 681
Jandak, Persia, 32, 166
Jankó, Dr. J., Land und Leute des Comitates Arad (New Publications), 561
Jannescu, G., Ratiunea geologică a principalelor aliniamente geografice (New Publications), 107
Janssen, M. J., Troisième ascension . . . du Mont Blanc (New Publications), 448
Japan—
Bradyseismical movements in, 232, 233
Earthquakes and volcanoes of, 235
Land fauna of, 136
Mountain systems of, 126
Seismological society of, 239
Japan, New Publications—
Essai sur l'Architecture Japonaise, par F. Levieux, 330
Fortentwicklung . . . des japanischen Kunstgewerbes, von J. Rein, 441
Industrial and Commercial Development of, by J. Troup, 678
Luftströmungen in Japan, von E. Knipping, 441
Petroleum Industries at Nagaska, by H. B. Newell, 441
The Japanese Landscape, by C. MacCauley, 441
Verkehr Japans mit dem Auslande, von Dr. S. Tanaka, 563
Japan, Korea, China, New Publications—Problems of the Far East, by Hon. G. Curzon, 440
Japanese alpine bell-flower, 136
Japanese Alps, Exploration in the, 1891–94, by Rev. W. Weston, 125 *et seq.*
Japanese Alps, direction of, 126, 127; geological structure, 128, 147; volcanic peaks, 128, 147; passes, 128; rivers and lakes, 129; snowfall on, 130; hot springs and baths, 131, 132; minerals and flora, 134, 147, 148; fauna and birds, 136, 137; archæological remains, 148
Japanese people, hospitality and politeness of the, 138; silk industry of, 139, 140; superstitions, 141–144
Japanische Reise um die Welt, von K. Tamai (New Publications), 225
Java, New Publications—
De Garĕbĕg's te Ngajogyákartá, door J. Groneman, 212
Jeanneret, Philippe, Les Ma-Khoça (New Publications), 563
"Jeannette Relics," The so-called, by Prof. Dall (New Publications), 566
Jebel Ses, 549
Jefferson, R. L, Awheel to Moscow and back (New Publications), 328
Jenks, E., The History of the Australasian Colonies (New Publications), 336
Jeppe, F., Map of the Southern Goldfields of the Transvaal (New Maps), 451
Jews, History of the, by Prof. H. Graetz (New Publications), 339
Jiménez y Lluesma, Los ferro-carriles del Pirineo (New Publications), 677
Johannesburg, New Publications—
Bi-Annual Report, etc, of Sanitary Committee, by Ch. Aburron, 215
Johnson, A. C., The Bearings of the Principal Bright Stars, etc. (New Publications), 447
Johnston, W. and A. K., Map of Nubia and Abyssinia (New Maps), 573
———————, Map of the Transvaal, etc. (New Maps), 342
———————, Map to illustrate the Armenian Question (New Maps), 342
———————, Map to illustrate the Ashanti Expedition (New Maps), 121
Johnstone, Major-General H. C., Obituary of, 209
Johnstone, the late Sir J., My Experiences in Manipur, etc. (New Publications), 329
Jordan, W. L., The Cardioid Earth (New Publications), 224
Jordan, New Publications—
Au dela du Jourdan, by M. Gautier, 112
Jordan and the Dead Sea, A Journey East of the, by Gray Hill (New Publications), 442
Jostedal Norvège, Glacier du, by Mme. Martel (New Publications), 109
Jubilee of Russian Geographical Society, 310
Jumma, Jebel, Tripoli, 158, 159
Junker, Wilhelm, von L. Hevesi (New Publications), 569
Junod, H., Une course au Tembé (New Publications), 564

Jura, New Publications—
Grottes du Jura méridional, par M. Corcelle, 438

K.

Kabara, Timbuktu, 99
Kach Gandava, Makran, 399
Kachins Sana section of the, 93
Kafirs of the Hindu Kush, The Origin of the, by Col. Holdich, 42 *et seq.*
Kafirs, The Afghan Campaign against the, 547
Kahza pass, Oman, 524
Kaindl, Dr., Ethnologie . . . der Huzulen (New Publications), 439
Kais, or Al-Kais, ancient trading centre, 644
Kal-Mura river, Persia, 167
Kama country, delta of the Ogowé, 95
Kamdesh Kafirs, 42
Kami-oro-hi, ceremony of the Japanese, 144
Kanát, or subterranean aqueducts, 645
Kanazbun, Makran, 398
Kandabel or Gandava, Makran, 399
Kangéan-Archipel: *see* Malay Archipelago
Kapte or Athi plains, 662
Karafuto system of the Japanese Alps, 126
Karangarua valley, New Zealand, 492
Kara-Timor districts, Batak Land, 79
Karmati ancient tombs, 402
Karpinsky, M., Sur le caractère . . . de l'écorce terrestre dans la Russie d'Europe (New Publications), 328
Kashan, height of, 166
Kashgar to Yarkand, road from, 454
Kashmir, New Publications—
Kashmir, by Sir L. Griffin, 111
Kashmir, by W. R. Lawrence, 329, 441
The Valley of Kashmir, by W. R. Lawrence, 111
Kasr Zuguseh, Ferjana district, 155
Katuaka village, position of, 429
Kavir or Dasht-i-Kavir, Persia, 34, 36, 165, 166
Kayser, Dr. J., Biography of (New Publications), 222
Kea bird of New Zealand, 486, 502
Keane, A. H., Stanford's Compendium of Geography and Travel, vol. ii., South Africa (New Publications), 113; notice of, 275
———, Ethnology (New Publications), 338; notice of, 433
Kej, valley of, Makran, 394
Keng Hung, Shan States, 588
Keng Tung plain, town and churches, 592–595
Kenia, Mount, Dr. Kolb's ascent of, 550
Kenney-Herbert, Capt., Best Method of Teaching Military Sketching (New Publications), 567
Kerbela, New Publications—
A Pilgrimage to, 331
Kergrohen, M., Mission Scientifiques dans le golfe de Gascogne (New Publications), 683
Kerguelen Region, Marine Fauna of the, etc., by Dr. John Murray (New Publications), 337; notice of, 538
Keria to Cherchen, road from, 457
Kéthulle, Ch. de la, Deux années . . . chez le sultan Rafaï (New Publications), 331
———, journey on the borders of Darfur, 428
Khabur river, 658
Khairokot ruins, Makran, 400
Khamptis tribe, 591 *note*
Khamti to Assam, Prince Henry of Orleans' route from, 306
Khamti, the Plain of, 305
Khiva, New Publications—
Bilder aus Chiwa, von H. Vambéry, 441
Khotan, jade trade in, 456
Khur, identification of, 673
Kiang-Kong, Shan States, 584
Kibwesi district, plains of the, 662
Kiepert and Moisel, Karte von Deutsch-Ostafrika (New Maps), 450
Kiepert, Dr. R., "Neue Aufnahmen deutscher Offiziere in Usagara, etc." (New Publications), 563
Kiersnowsky, J., Distribution du vent . . . l'Empire Russe (New Publications), 677
Kikuyu, East Africa, 662
Kilauea, New Publications—
A View of Kilauea, 566
Kilian and Penck, MM., Les dépots glaciaires, etc. (New Publications), 220
Kilimanjaro, rainfall, etc., observations on, taken by Dr. Wildenmann, 429
Kinabalu, Mount, Dr. Haviland's expedition to, 430
Kingsley, Miss M. W., Travels on West Coast of Equatorial Africa (New Publications), 564
———, Travels in West Africa, 95
Kirby, F. V., In Haunts of Wild Game (New Publications), 332
Kirchhoff, Dr., Die Lagenverhältnisse von Erfurt (New Publications), 107
———, Die Marshall-Inseln (New Publications), 336
———, Der "Politischen Geographie" im Schulunterricht (New Publications), 223
Kitao, Dr., Beiträge zur Theorie der Bewegung der Erdatmosphäre, etc. (New Publications), 118
Kitwyi, On a Journey from Machako's to, by J. Ainsworth, 406
Kivu, Lake, Central Africa, 273 *and note*
Kiz or Kej district and town, Makran, 397
Kiz Kaián, Makran, 390
Kizil Robat Gumbaz, 92, 93
Klaksvig, Færoes, 11
Klein, Dr., Jahrbuch der Astronomie und Geophysik (New Publications), 448
Kling, Hauptmann, Meine Reise in Togoland (New Publications), 563
Knight-Bruce, Bishop G. W. H., Memories of Mashonaland (New Publications), 332

Knipping, E., Luftströmungen in Japan (New Publications), 441
Kobelt, Dr. W., Die zoogeographische Stellung der Insel St. Helena (New Publications), 679
Kolb, Dr, ascent of Mount Kenia, 550
Kolgueff Island, by Colonel Feilden (New Publications), 439
————, warm currents off, 556
Kondratenko, E., Ethnographical Maps of Transcaucasia, 548
Kootanie, West, Canada, 413
Köppen, N. v., Die Kulturentwickelung Finnlands (New Publications), 109
Kordon, F., Touren im Bereiche des Malleinthales (New Publications), 107
Korea, New Publications—
Gewichte . . . in Korea, von H. Arnous, 330
Körösi, J., und Dr. Thirring, Resultate der Volksbeschreibung und Volkszählung (New Publications), 108
Koslowsky, J., Tres semanas entre los Indios Guatós (New Publications), 445
————, Algunos datos sobre los Indios Bororós (New Publications), 445
————, El rol de los Termitos, etc. (New Publications), 449
Kossina, Dr. G., Entwicklung der Germanische Volksgrenzen (New Publications), 561
Kotto river, Congo basin, 203
Kraemer, Dr. A., Ein Planktonausflug . . . Gegend Neu-Seelands (New Publications), 566
Krahmer, Generalmajor, Die altarmenische Hauptstadt Ani (New Publications), 213
————, Die Seen der Gouvernements Twer, Pskow und Smolensk (New Publications), 109
————, Expedition . . . in Mittelasien (New Publications), 677
————, Transbaikalien (New Publications), 213
Krassnow, Prof. v., Beobachtungen aus dem Gebiet der nordostasiatischen Inselwelt (New Publications), 442
————, The Island of Sakhalin, 422
Kraus, F., Geographie und Höhlenkunde (New Publications), 221
Krauss, P., Spezialkarte von Deutsch-Ostafrika (New Maps), 687
Krebs, W., Das Klima Ost-Asiens (New Publications), 329
Krka, Hydrologie der Unteren, von Dr. Gavazzi (New Publications), 106
Kuen-lun, New Publications—
Das System des Kwenlun, von K. Bogdanowitch, 331
Kuh-i-Rudbar, Persia, 27
Kuh-i-Tezarjun, Persia, 30, 31
Kühr, E., Schetsen uit Borneo's Westerafdeeling (New Publications), 441
Kunlon railway line, 601
Kunz, H., Chile und die Deutschen Colonien (New Publications), 565
Kurmet al Hatheia, Tripoli, 156
Kuryat, Oman, 535
Kurze, G., Reisen norwegischer Missionare in Madagaskar (New Publications), 679
Kusi River, New Publications—
Changes in the Course of the, by F. A. Shillingford, 212
Kuyuni, Upper, Note to Sketch-Map of the, by Lieut. Godfrey-Faussett, 541
Kwilu river, Congo region, 553

L.

Labour question in Central Africa, 374, 375
Labrador peninsula, Mr. Low's explorations in, 414
Lachenmaier, G., Hellenische Kolonisation (New Publications), 568
Ladak, Tibet, 477
Lagos, New Publications—
New Rubber Industry in, 214
Lahontan, Le baron de, par J. E. Roy (New Publications), 222
Lahore, New Publications—
Its History, etc., by Syad Muhammad Latif, 330
Lake-Basins of subalpine Switzerland, 655
Lake District drainage, 621
Lakeland, English, The Waterways of, by J. E. Marr, 602 *et seq.*
————, radial stream-system of, 603 *et seq.*; radial drainage and early changes, 610; establishment of fault-valleys, 611; Strike-valleys, 613; changes of the Glacial Period, 613; deviation of stream courses, 616–619; Post-Glacial gorges, 620; stream erosion curves, 621
Lakes in the Basin of the Lech, Dr. Halbfass' observations on, 198
Lamajen tribe on the Mekong, 301
Lamas of Tibet, 470, 472
Langenbeck, Dr., Der erdkundliche Unterricht (New Publications), 223
Langhans, P., Beiträge zur Kenntnis der Deutschen Schutzgebiete (New Publications), 217
————, Fremde Volkstämme im Deutschen Reich (New Publications), 108, 225
Langstrath alluvial plain, 616
Laodiceia, Asia Minor, 191
La Plata Museum, New Publications—
Notas Arqueológicas, etc., por S. A. F. Quevedo, 444
Lapparent, M. de, L'art de lire des cartes Géographiques (New Publications), 683
Lapparent, Prof. A. de, Dépressions et déserts (New Publications), 117
Lar, Persia, 25
Lassen, C. H., Momenter af Vestindiens Geografi (New Publications), 217

Last, J. T., Notes on the Languages spoken in Madagascar (New Publications), 214
Latif, Syad Muhammad, Lahore, its History, etc. (New Publications), 330
Launay, A., Mandchourie et Sibérie Orientale (New Publications), 212
Laurent, M., Une visite à la prison de Bokhara (New Publications), 329
Lava Beds at Meriden, Conn., Quarries in the, by Prof. W. M. Davis (New Publications), 334
Lawrence, W. R., Kashmir (New Publications), 329, 441
———, The Valley of Kashmir (New Publications), 111
Lazaro e Ibiza, D., Regiones botanicas de la peninsula iberica (New Publications), 677
Lebanon, New Publications—
Barometrical . . . Determination of Heights in Lebanon, by Prof. R. H. West, 678
Lech, Lakes in the Basin of the, Dr. Halbfass' observations, 198
Lee, Sidney, Dictionary of National Biography (New Publications), 449
Lefroy, Mount, Canadian Rockies, 51
Leif Ericson, Flateyjarbok (New Publications), 119
Leitner, Dr., New Dangers and Fresh Wrongs (New Publications), 111
Lemnos, L'île de, par M. de Launay (New Publications), 109
Lemurs of Madagascar, 289
Lena Delta, New Publications—
Beobachtungen der Russischen Polarstation an der Lenamündung, von Fuss, Müller und Jürgens, 112
Lenthéric, Ch., The Riviera, translated by Dr. West (New Publications), 212
Lenz, O., Die Maltagruppe (New Publications), 328
Lenz, Prof., Publicationen von (New Publications), 569
Leonhard and Volz, Das mittelschlesische Erdbeben (New Publications), 676
Lepsius, Dr., Geologische Karte des Deutschen Reichs (New Maps), 225, 686
Lesseps, F. de, par G. Gravier (New Publications), 339
Levellings, New Publications—
Dos nivelamentos de precisão e da sua superficie de referencia, pelo Conde d'Ávila, 117
Schätzungsgenauigkeit an Maassstäben, etc., von Dr. Reinhertz, 447
Leverett, F., The Preglacial Valleys of the Mississippi (New Publications), 114
Levieux, F., Essai sur l'Architecture Japonaise (New Publications), 330
Lhasa, Dr. Moewis' attempt to reach, 95
———, Mr. Littledale's attempt to enter, 469–473
Liberia, New Publications—
Third Report . . . New York State Colonization Society, by O. T. Cook, 563
Library Catalogue, New Publications—
Catalogue of Library of, Ceylon Branch of Royal Asiatic Society, 570
Katalog der Bibliotek . . . Deutschen Akademie, von O. Grulich, 570
Licona river, Sanga basin, 552
Likuala river, Sanga basin, 552
Limnology, New Publications—
Die Fortschritte der Limnologie, von Dr. Greim, 118
Limpricht, Dr., Begleitworte zu den Karten "Reiseroute der Expedition des deutschen Kamerunkomitees" (New Publications), 114
Linden, Graf K., Gedächtnisrede zu Ehren . . . E. Metzger (New Publications), 569
Lindenkohl, A., Resultate der Temperatur . . . des Golfstroms, etc. (New Publications), 448
———, Spezifisches Gewicht . . . im Golf von Mexico und im Golfstrom (New Maps), 452
Lipari Islands, New Publications—
Die Liparischen Inseln, by Archduke Ludwig Salvator, 328
Lissus tribe on the Mekong, 301
Lister, A., Guide to the British Mycetozoa (New Publications), 448
Listu, R., Viage a los Andes Australes (New Publications), 682
Littledale, St. G. R., A Journey across Tibet, etc., 453 *et seq.*
———, arrival in England, 198
Littlehales, G. W., Improbability of finding Isolated Shoals, etc. (New Publications), 448
———, The Form of Isolated Submarine Peaks (New Publications), 338
Loangwa river, Central Africa, 372
Lobley, J. Logan, Volcanic Phenomena (New Publications), 568
Lóczy, Prof. L. von, von Prof. Palóczy (New Publications), 339
Longmans & Co., Relief Map of England and Wales (New Maps), 342
Lophiomys of Africa, 285
Lord, W. F., The Lost Possessions of England (New Publications), 685
Lorenz—Jordell, Catalogue . . . Librairie Française (New Publications), 570
Lorenz-Liburnau, Dr. J. v., Donau-Studien (New Publications), 438
Lorenzo Marques, New Maps—
Esboço da Carta do Districto do Lourenço Marques, por E. de Noronha, 687
Lorenzo Marques, New Publications—
Acerca de Lourenço Marques, by A. de Castilho, 443
Lourenço Marques, by P. Berthoud, 563
Lösses, Alter und die Verbreitung des, von Du Pasquier and Penck (New Publications), 683
Louise, Lake, in the Canadian Rocky Mountains, by W. D. Wilcox, 49 *et seq.*

Low, A. P., explorations in the Labrador peninsula, 414
Loweswater, Lakeland, 618
Loyalty Islands, New Publications—
Notes pittoresques sur les îles Loyalty, par M. Bénet, 218
Lu river of Tibet, 200
Lubbock, Sir J., On the General Configuration of the Earth's Surface (New Publications), 338
Luchuan Language, Essay in aid of a Grammar and Dictionary of the, by B. H. Chamberlain (New Publications), 441
Ludwig Salvator, Archduke, Columbretes (New Publications), 108
———————, Die Liparischen Inseln (New Publications), 328
Luena river, Central Africa, 663
Luftanstauches zwischen beiden Hemisphären, Zur Frage des jahreszeitlichen, von O. Baschin (New Publications), 118
Lugard, Capt. F. D., A Journey in West Africa, etc. (New Publications), 114
———————, England and France in the Nile Valley (New Publications), 214
———————, New British Markets, III. Tropical Africa (New Publications), 113
———————, The Extension of British Influence in Africa (New Publications), 112
Lune, source of the, 613
Lune and Eden, the initiation of the, 605
Lus Bela, Makran, 388, 398, 399
Lyall, Sir J. B., Punjab Irrigation (New Publications), 441
Lycos valley, Asia Minor, 191
Lyde, L. W., Man on the Earth, etc. (New Publications), 340
Lynch, H., The Armenian Question (New Publications), 440
Lynn, W. T., C. Ptolemy and his Works (New Publications), 569

M.

MacCauley, C., The Japanese Landscape (New Publications), 441
Macgregor, Sir W., British New Guinea (New Publications), 116
———————, Journey across Fergusson Island, 432
Machado, J., O territorio de Manica e Sofala, etc. (New Publications), 443
Machako's to Kitwyi, On a Journey from, by J. Ainsworth, 406
Mackinder, H. J., lectures on "The Principles of Geography," 91
———————, Remarks on "Proposed Geographical Description of the British Islands," 357
———————, Remarks on "The Waterways of English Lakeland," 624
MacMahon, Major, Terrestrial Refraction (New Publications), 218
Maçoudi, Note sur un ouvrage attribué à, par M. de Vaux (New Publications), 684
Macoun, J., The Forests of Canada (New Publications), 114
Macronisi, New Publications—
Le rocher de la Belle Hélène, par H. Hauttecoeur, 676
Madagascar, fauna of, 287
Madagascar, New Publications—
Antananarivo Annual, etc., by Revs. Sibree and Baron, 443
Ce qu'il faut connaitre de Madagascar, by Caustier and others, 113
Flore de Madagascar, par E. Bureau, 443
La colonisation à, par Dr. F. Delisle, 679
Languages spoken in, by J. T. Last, 214
Les peuples de Madagascar, par H. Mager, 332
L'importance de Madagascar, par M. Nogues, 214
Madagascar, les forêts, le caoutchouc, par G. Vasco, 214
Madagascar, par M. Martineau, 332
Madagascar, von Dr. Spielmann, 443
Reisen norwegischer Missionare in, von G. Kurze, 679
Madras, New Publications—
Report on Administration of Madras Presidency, 1894–95..677
Madre de Dios, islands of, 188; tribes of, 189
———————, Recent discoveries in the Basin of the, by C. R. Markham, 187
Madsen, O. E., Om Betydningen af Landenes geografiske Forhold for deres Magtomraade (New Publications), 685
Mæander Valley, Middle, Asia Minor, 192
Magdalena, New Maps—
Carta corográfica del Departemento de, por F. Simons, 228
Mager, H., Les peuples de Madagascar (New Publications), 332
Magnetic Intensity, New Publications—
Ueber den Zusammenhang zwischen der Erdmagnetischen Horizontal-intensität, von Dr. Fritsche, 219
Magnetism, New Publications—
Der normale Erdmagnetismus, von W. von Bezold, 568
Magnus, Olaus, New Publications—
Haus framställning af nordens geographie, af K. Ahlenius, 568
Mahaffy, J. P., The Empire of the Ptolemies (New Publications), 332
Mahdist Power on the Upper Nile, M. Wauters on, 552
Maheyrun, Persia, 24
Mähly, Dr. E., Studien von Goldküste (New Publications), 114
Main, Capt. W. S., observations on the Great Bank of Newfoundland, 316
Maistre, M., Book on Africa, Review of, 271

Makran, Letter from Mr. G. N. Curzon on the etymology of, 557
———, Ancient and Mediæval, Letter from Major-Gen. Haig on, 668
———, meaning of name, 388, 669; ruins and sepulchres, 389; waves of migration through, 391; topography, 394, 670; decline of, 393; valleys of, 394; ethnology of, 669
———, Notes on Ancient and Mediæval, by Colonel Holdich, 387 *et seq.*
Makran, New Publications—
Notes on Ancient and Mediæval Makran, by Colonel T. H. Holdich, 677
Malagasy Subregion of the Geography of Mammals, 287
Malaio-Polynesische Forschungen, von Dr. Brandstetter (New Publications), 222
Malay Archipelago, New Publications—
Bijdrage tot de Kennis van den Kangéan-Archipel, door J. van Gennep, 441
Malay Sketches, by F. A. Swettenham (New Publications), 330
Maler, T., Yukatekische Forschungen (New Publications), 115
Malta, New Publications—
Die Maltagruppe, von O. Lenz, 328
Malta and the Maltese Race, by Rev. W. Bedford, 439
Malteinthal, New Publications—
Touren im Bereiche des Malteinthales, von F. Kordon, 107
Mammal-Fauna of the Ethiopian Region, 284
Man in the Tropics, Dr. Däubler on (New Publications), 339
Man on the Earth, etc., by L. W. Lyde (New Publications), 340
Manchuria, New Publications—
Mandchourie et Sibérie Orientale, par A. Launay, 213
Mandalay, line of railway from, 588
Manica e Sofala, O territorio de, by J. Machado (New Publications), 443
Manila Observatory, New Publications—
Baquios ó Tifones de 1894, por J. Algué, 213
Manipur, New Publications—
My Experiences in, by the late Sir J. Johnstone, 329
Mankind, The History of, by F. Ratzel (New Publications), 118
Manyala, E. Africa, 410
Maps, Local, in American Schools, Prof. Davis on, 665
Maps, New—
Africa, 121, 228, 342, 450, 573, 687
America, 121, 228, 342, 451
Asia, 226, 342, 572, 687
Australasia, 451, 573, 688
Charts, 122, 228, 343, 452
Europe, 120, 225, 341, 449, 572, 686
General, 228, 342, 452, 574
Maps, New Publications—
L'art de lire des cartes géographiques, par M. de Lapparent, 683
Maps, New Publications—*continued.*
Projet d'une carte de la terre au 1 : 1,000,000, par A. Germain, 117
Réduction des cartes topographiques à la même échelle, par M. Venukoff, 447
Søkaart-Archivets Antike Kaartsamling, 119
Sopra tre speciali projezioni meridiane, etc., by M. Fiorini, 119
Ueber die Wahl der Projektionen für die Länderkarten, etc., von Dr. Bludau, 117
Marbut, C. F., Geographic Development of Crowley's Ridge (New Publications), 333
Marchand, Capt., Sept ans d'Afrique (New Publications), 114
Marine deposits and sea water from the Antarctic, Dr. Murray's reports on, 517
Marine Fauna of the Kerguelen Region, Dr. J. Murray on, 538
Marine type in Lake Tanganyika, Organisms of, 663
Markham, Clements R.—
Boundaries of British Guiana, The Evidence of Maps, 277, 309
Election as Honorary Member of Geneva Geographical Society, 90
Honour to, 654
Note on British title to British Guiana, 100
Recent Discoveries in the Basin of the River Madre de Dios, 187
Remarks on "A Journey across Tibet," 478, 482
Remarks on an Antarctic Expedition, 325
Remarks on centenary of John Cabot's voyage, 675
Remarks on Col. Trotter's journey to source of the Niger, 436
Remarks on death of Gen. Walker and Cristoforo Negri, 437
Remarks on death of Lady Burton, 559
Remarks on death of Mr. Childers, 325
Remarks on "Exploration in the Japanese Alps," 146, 149
Remarks on "First Crossing of the Southern Alps of New Zealand," 499, 502
Remarks on "Movements of the Earth's Crust," 247
Remarks on "Proposed Geographical Description of the British Islands," 356, 360
Remarks on Rumours of Nansen's Expedition, 436
Remarks on "The Country of the Shans," 600
Remarks on "The Færoes," 22, 23
Remarks on "The Waterways of English Lakeland," 622, 625
Markoff, Dr. A., Der zukünftige Handel Chinas (New Publications), 440
———, The Towns of Northern Mongolia (New Publications), 440
Marr, J. E., The Waterways of English Lakeland, 602 *et seq.*

Mars et la Terre, par M. Gautier (New Publications), 224
Marseilles, New Publications—
L'extension . . . du massif ancien des Maures, par M.M. Vasseur et Fournier, 439
Marshall Islands, The, by Dr. Steinbach, 296
Marshall Islands, New Publications—
Die Marshall-Inseln, von Dr. A. Kirchhoff, 336
Steinbach and Schwabe's work on the, 218
Martel, E. A., Speläological Society founded by, 434
————, Sous Terre (New Publications), 221
————, Sur quelques anomalies de la température des sources (New Publications), 449
Martel, Mme. A., Traversée du Glacier du Jostedal Norvège (New Publications), 109
Martin, Hon. G. B., Map of the Province of British Columbia (New Maps), 342
Martineau, M., Madagascar (New Publications), 332
Masha, Persia, 31
Máshi, Persian Gulf, 644
Mashonaland, New Publications—
Memories of, by G. W. Knight-Bruce, 332
Maskan, Makran, 403
Massachusetts, New Publications—
Geology of the Green Mountains in, by Rumpelly, Wolff, and Dale, 216
Mathews, R. H., Aboriginal Bora held at Gundabloni in 1894 (New Publications), 116
———— ————, Aboriginal Rock Pictures of Australia (New Publications), 116
Mathiesen, Gén., Les vents et les courants de la Mer (New Publications), 220
Matsushiro, archæological remains at, 148
Mauch, Christoph, Der Bernstein (New Publications), 570
Maumené, M., Bizerte et son nouveau port (New Publications), 215
Mauritius, fauna of, 284
May, Capt. W. W., Obituary of, 324
Maydon, J. G., Natal (New Publications), 563
Mayr, Dr., Zur Technik der Ausbeutung berufsstatistischer Angaben (New Publications), 569
Mazauric, F., Les cavernes de la Boudène au Mas Cabanis (New Publications), 438
McAlpine, D., Australian Fungi, etc. (New Publications), 336
McCormick, A. D., An Artist in the Himalayas (New Publications), 441
McInnes, Mr., work in Western Ontario, 413
M'Crindle, J. W., Arabia and Abyssinia in Ancient Times (New Publications), 570
Medals, Royal, and other awards for 1896. .654
Mediterranean, New Publications—
Columbretes, by H.I.H. Archduke Ludwig Salvator, 108
Erforschung des östlichen Mittelmeeres, 448
Mediterranean Winter Resorts, by E. A. Reynolds-Ball, 685
Physical Conditions of the Mediterranean Basin, etc., by Prof. E. Hull, 108
Meeson, J. T., Notes on the Meteorology of Canterbury and Westland, etc. (New Publications), 116
Meetings of the R.G.S., Session 1895–96.. 105, 106, 211, 325, 436, 437, 559, 560, 675
Meinecke, G., Aus dem Lande der Suaheli (New Publications), 442
Mekiskan river, Canada, 316
Mekong river, Shan States, 583, 584
————————, affluents of, 586
Mekong river, 94, 302
————, navigation of the, 200
———— to Assam, Prince Henry of Orleans' Journey from the, 199
Melhop, W., Historische Topographie der Freien und Hansestadt Hamburg (New Publications), 560
Men and Women of the Time, by V. G. Plarr (New Publications), 119
Mendaña, A. de, Viaje que hizo, por D. C. F. Duro (New Publications), 684
Mendoza, New Publications—
Topográfico y Geológico de San Cárlos, etc., 444
Menéres, A. da F., Relatorio . . . da Associação Commercial do Porto (New Publications), 439
Menon, C. A., Report on the Census of Cochin (New Publications), 329
Menschlichen Ansiedelungen, Die Lage der, von A. Hettner (New Publications), 118
Mercié, E., De l'Annam au Mékong (New Publications), 111
Meriden, Quarries in the Lava Beds at, by W. M. Davis (New Publications), 334
Mersey, New Publications—
Navigation of River Mersey, by Admiral Richards, 561
Sea Approaches to the Mersey, by Lieut. M. Sweny, 561
Mesny's Chinese Miscellany (New Publications), 111
Metchnikoff, L., Que signifie le nom de Yangtze? (New Publications), 562
Meteorological Congress, International, Report of, edited by O. L. Fassig (New Publications), 220
Meteorological Observations at Stations of the Second Order for 1891 (New Publications), 328
Meteorological Station, High-level, in the Balkan Peninsula, 544
Meteorology, New Publications—
Die Wetterdienst an der Deutschen Seewarte, von Dr. van Bebber, 118

Meteorology, New Publications—*contd.*
Ergebnisse der Gewitter-Beobachtungen im Jahre 1891, von Dr. Assmann, 108
Ergebnisse der Niederschlags-Beobachtungen im Jahre 1893..108
Étude sur la loi des tempêtes, par A. Schwérer, 220
Jahrbücher . . . fur Meteorologie and Erdmagnetismus, 683
La circulation des vents, par M. Duponchel, 118
Meteorologische und Magnetische Beobachtungen in Griechenland, von H. Hartl, 108
Phénomènes des hautes regions de l'atmosphere, par A. Cornu, 568
Theorie der Bewegung der Erdatmosphäre, etc., von Dr. Kitao, 118
Variations de la vitesse des vents, etc., par J. Plumandon, 220
Zur Frage des jahreszeitlichen Luftanstauches, etc., von O. Baschin, 118
Metzger, E., Verkehrsmittel und der Mensch (New Publications), 568
————, von K. von Linden (New Publications), 569
————, Württembergische Forschungsreisende, etc. (New Publications), 569
Meuleman, E., Étude sur les animaux domestiques au Congo (New Publications), 442
Meunier, S., Essai d'application de la méthode expérimentale à l'histoire orogénique de l'Europe (New Publications), 117
Mewius, F., Zur Südpolarforschung (New Publications), 447
Mexican Drainage Canal, by F. H. Cheesewright (New Publications), 444
Mexico, Gulf of, New Maps—
Oberflächenwassers im, von A. Lindenkohl, 452
Mexico, New Publications—
Beiträge zur Ethnographie von Südost-Mexiko und Britisch-Honduras, von Dr. Sapper, 115
Die Grenze zwischen Mexico und Guatemala, von Dr. Polakowsky, 115
Explorations in Cape Region of Baja California, by G. Eisen, 679
On the Bio-Geography of, by C. H. T. Townsend, 333
Meyer, Dr. H., Der Insel Tenerife und ihre Bewohner (New Publications), 113, 331
Mezara, Oman, 534
M'Gee, W., Potable Waters of the Eastern United States (New Publications), 216
Michow, H., Geographische Ausstellung . . . in London (New Publications), 684
Middendorf, E. W., Peru, Beobachtungen und Studien, etc. (New Publications), 335
Miessler, A., Prof. Dr. J. Euting (New Publications), 569
Miessler, A., Prof. G. Fritsch (New Publications), 569
————, Oskar Borchert (New Publications), 339
————, M. D. Cowan (New Publications), 339
Mijlas, Wadi, 536
Miles, Col. S. B., Journal of an Excursion in Oman, 522 *et seq.*
Military Geographical Institute in Vienna, 91
Military Sketching, On Best Method of Teaching, by Capt. Kenney-Herbert (New Publications), 567
Mill, Dr. H. R., Geography as a Science in England (New Publications), 340
————, Proposed Geographical Description of the British Islands on the basis of the ordnance survey maps, 345 *et seq.*
————, Recent Geographical Bibliographies, 72
————, Remarks on "The Waterways of English Lakeland," 624
————, The Venezuela and British Guiana Boundary (New Publications), 217
Millosevich, Prof. E., Commemorazione del Principe E. Ruspoli (New Publications), 223
Millson, Alvan, Obituary of, 668
Millspaugh, C. F., Contribution to the Flora of Yucatan (New Publications), 444
Milne, F. A., English Topography (New Publications), 110
Milne, Prof. John, Movements of the Earth's Crust, 229 *et seq.*
————, remarks on "Exploration in the Japanese Alps," 149
Min river, Western China, 201
Mississippi, New Publications—
Origin of the Lower, by L. S. Griswold, 334
Pike's Expeditions to Headwaters of the, edited by E. Cones, 444
Preglacial Valleys of the, by F. Leverett, 114
Prehistoric Man at the headwaters of the, by J. V. Brower, 565
Missouri Geological Survey, vols. iv. to vii. (New Publications), 334
Mitre, B., Ulrich Schmidel (New Publications), 569
Mizon, M., Résultats scientifiques des voyages de (New Publications), 214
Mlanje Mountain, Central Africa, 370
Moab and Gilead, Narrative of an Expedition to, by Dr. Bliss (New Publications), 112
Mockler-Ferryman, Capt., Photographs of Norway, 344
Moeris, Ein altes Heiligtum an den Ufern des, von G. Schweinfurth (New Publications), 214
Moëro, Lake, New Publications—
Au lac Moëro, par Descamps, 213

Moewis, Dr., attempt to reach Lhasa, 95
Mohn, Dr. H., Jahrbuch des Norwegischen Meteor. Instituts (New Publications), 676
Moï. Une incursion chez les, par M. d'Enjoy (New Publications), 111
Molard, J., Cours de Géographie (New Publications), 224
Moldenhauer, Dr., Niederschläge im nordwestlichen Deutschland (New Publications), 439
Molengraaf, Prof., Die Niederländische Expedition nach Zentral-Borneo (New Publications), 110
Molesworth, Sir G., Report on Proposed Railway from Mombasa to Victoria Nyanza (New Publications), 112
Moluccas, Discovery of the, by Dr. O. Warburg, 365
Moluccas, New Publications—
Wer ist der Entdecker der Gewürz-Inseln? von Dr. O. Warburg, 563
Mombasa to the Victoria Nyanza, The New Road from, 662
Mombasa to Victoria Nyanza, Report by Sir G. Molesworth on Proposed Railway from (New Publications), 112
Monaco, Prince A. de, Sur la deuxième campagne scientifique de la *Princesse-Alice* (New Publications), 220
Mong Hang, subterranean river at, 582
Mongolia and Manchuria, M. Cuaffanjon's Journey in, 550
Mongolia, New Publications—
Die Mongolei-Ethnographische Skizze, von Dr. Iwanowski, 111
Towns of Northern Mongolia, by Dr. A. Markoff, 440
Montaner, Don Ramon, Limites con la República Arjentina (New Publications), 217
Mont-Blanc, Troisième Ascension à l'Observatoire, par M. Janssen (New Publications), 448
Monteil, Col., De St. Louis à Tripoli, review of, 270
Montenegro, New Publications—
Natürlichen und politischen Grenzen von Montenegro, von Dr. Hassert, 109
Mooney, J., The Siouan Tribes of the East (New Publications), 216
Morgan, E. Delmar, remarks on "A Journey across Tibet," 481
Morgan, J. de, Mission Scientifique en Perse (New Publications), 112, 331
Morphology of Coasts, 318
Morris, Dr. D., The Sisal Industry in Bahamas (New Publications), 566
Moscow and back, Awheel to, by R. L. Jefferson (New Publications), 328
Mossdale, Lakeland, 615
Moshi on Kilimanjaro, rainfall, etc., observations at, taken by Dr. Wildenmann (New Publications), 332; note on, 429
Mosquito-Küste, Der Streit um die, von J. Richter (New Publications), 445
Mossman, R. C., The Frost of 1895 in Scotland (New Publications), 677
Mountain growth, 232
Movements of the Surface Waters of the North Sea, by H. N. Dickson, 255 *et seq.*
Msid, Jebel, Tripoli, 156
Mueller, Baron von, Select Extra-Tropical Plants, etc. (New Publications), 221
Mugger Pir, or Manja Pir, Makran, 401
Mugheira, Wadi, 524
Muhso tribe, Shan States, 597, 601
Muller, Dr., Beiträge zur Lehre der Wortzusammensetzung, etc. (New Publications), 685
Muller, J. J. A., De verplaatsing van eenige Triangulatie-Pilaren in de Residentie Tapanoeli (Sumatra) (New Publications), 212
Mullet and Inishkea Islands, Ethnography of, by C. R. Browne (New Publications), 328
Mundame und Baliburg, Ueber das Gebiet zwischen, von G. Conrau (New Publications), 332
Munro, Anderson, and Anthony, Messrs., Photographs of North-West Asia Minor (New Maps), 344
Munro, Dr., Rambles and Studies in Bosnia-Herzegovina (New Publications), 212
Murman Coast, warm current along the, 556
Murray, Dr. John, Marine Fauna of the Kerguelen Region (New Publications), 337; note on, 538
————————, remarks on marine deposits, etc., from the Antarctic, 517
————————, The *Challenger* Medal presented by, 206
Muscat, by J. T. Bent (New Publications), 110
Muskeg, The Land of the, by H. Somers Somerset (New Publications), 114
Musson and Roxburgh, Handbook of Jamaica for 1896 (New Publications), 566
Mweru, Lake, desiccation of, 368
————————, elephants in district of, 374
————————, Mr. Weatherley's New Route to, 204
Mweru, meaning of word, 378
Myggenæs, Færoes, 14–17

N.

Naalsö, Færoes, 10
Nachimbwe's village, 183, 184
Nanga Parbat Range, Climbing on the, by Dr. J. N. Collie (New Publications), 441
Nansen, Dr., North Polar Expedition, 317, 433, 436, 555
Nansen's Polar Expedition, by Gen. A. W. Greely (New Publications), 567
Natal, New Publications—
Natal, by J. G. Maydon, 563
Nathorst, A. G., Frågan om istiden . . . Europa (New Publications), 560

Natural Sciences, Formulation of the, by E. D. Cope (New Publications), 685
Nautical Almanac and Astronomical Ephemeris for 1899 (New Publications), 219
Navas, Conde de las, Juan de la Cosa y su Mapa Mundi (New Publications), 683
Navigation, New Publications—
Fast Passages and Best Routes, by W. Allingham, 567
How to manage a ship in a typhoon, by Dr. Doberck, 567
Navigation et la carte marine, Problèmes de, par M. Guyon (New Publications), 337
Negri, Cristoforo, Obituary of, 435
Netherlands, Royal Meteorological Institute of the, Atlas of the, 267
Neumann, Dr. E., Die Grundlinien Anatoliens und Centralasiens (New Publications), 329
————, Die methodischen Fragen in der Geographie (New Publications), 340
————, Reisen in Anatolien (New Publications), 329
Neumann, Prof. L., on Geographical Methods, 665
Neumayer, Dr., Stiller Ozean, Atlas von 31 Karten, Herausgegeben von (New Maps), 688
Nevado Colorado de Famatina, Primera ascension al, por R. Hauthal (New Publications), 445
Neville, Lieut.-Col., Six Tactical Problems, etc. (New Publications), 440
New Caledonia, New Publications—
L'Archipel de la Nouvelle-Calédonie, par A. Bernard, 116
New England, New Publications—
Vital Statistics of the New England States for 1892..114
New Guinea, Sir W. Macgregor's journey across Fergusson Island, 432
————, Dutch, Lieut. Velthuyzen's explorations in, 432
————, Herr O. Ehlers' last expedition in, 431
New Guinea, New Publications—
British New Guinea, by Sir W. Macgregor, 116
Discovery of the Great Purari River, by T. Bevan, 218
New Hebrides, New Publications—
Report on Solfataras and Sulphur Deposits of Vanua Lava, by Rendle and Levat, 566
New South Wales, New Publications—
Aboriginal Rock Paintings, etc., in, by R. H. Mathews, 116
Annual Report of the Department of Lands, 1894..446
Historical Records of, by F. M. Bladen, 446
Wealth and Progress of, by T. A. Coghlan, 446
New Zealand Alps, flora of, 485, 502; glacial period, 486; birds of, 489, 502
New Zealand, First Crossing of the Southern Alps of, by E. Fitz Gerald, 483 *et seq.*
————, Photographs of the Southern Alps of, by E. A. Fitz Gerald, 576
New Zealand, New Publications—
Avifauna Neu-Seelands, von Dr. Finsch, 446
Ein Planktonausflug . . . gegend Neu-Seelands, von Dr. A. Kraemer, 566
History of, by G. W. Rusden, 446
Meteorology of Canterbury and Westland, etc., by J. T. Meeson, 116
Mr. Fitz Gerald's work in, 116
Official Year Book for 1895, by E. J. von Dadelszen, 336
Reports on Mining and Minerals, 682
Statistics of the Colony for 1894..566
Newell, F. H., Public Lands and their Water Supply (New Publications), 680
————, Results of Stream Measurements (New Publications), 115
Newell, H. B., Petroleum Industries at Nagaoka (New Publications), 441
Newfoundland, The Great Bank of, Capt. Main's observations on, 316
Ngolo, New Publications—
Resa till Ngolo-landet, etc., af G. Waldau, 563
Niagara, Dr. Spencer's studies on the Great Lakes and, 204
Niagara, New Publications—
Duration of Niagara Falls and History of the Great Lakes, by J. W. Spencer, 115
Niam-Niam, New Publications—
Premiers éléments de langue Sandeh, ou, par A. Colombaroli, 333
Nicaragua Canal, the, 316
Nicaragua Canal, New Publications—
Interoceanic Canal through Nicaragua, 565
Present State of Nicaragua Canal, by Gen. A. W. Greely, 445
Report on Nicaragua Canal, by Capt. G. P. Scriven, 565
The Key of the Pacific, the Nicaragua Canal, by A. R. Colquhoun, 217
Nicaragua, New Publications—
Bureau of A. Republics, Bulletin of, 681
Du lac . . . par le fleuve San Juan, par P. Biolley, 565
Lecture on Nicaragua, by A. R. Colquhoun, 335
Nielsen, Dr., Eivind Astrup (New Publications), 449
Niger Basin, Dr. Gruner's Expedition in the, 96
Niger Delta to the Benin River, Major Copland-Crawford's journey from the, 661
——, Capt. Toutée's Expedition on the, 97
—— Region, Upper, Lieuts. Hurst and Bluzet's Explorations in the, 98

Niger, Source of the, Col. Trotter's visit to, 313
——, Swamps of the, 271
Niger, New Publications—
La France recule au Niger, par G. Demanche, 333
Ueberblick über die Niger-Expeditionen, etc., 1895, von B. Förster, 114
Upper Niger and Soudan, by L. Nott, 333
Nikitin, S., Bibliothèque Géologique de la Russie (New Publications), 676
Nile Reservoirs, The, by H. D. Pearsall (New Publications), 214
Nile, Upper, The Mahdist power on the, M. Wauters on, 552
Nile Valley, England and France in the, by Capt. F. D. Lugard (New Publications), 214
Nile, New Publications—
The Port of the Upper Nile, etc., by J. Heatley, 113
Nilis, Capt., explorations between the Welle and Darfur, 203
Nilis and de la Kéthulle, MM., journeys on the Borders of Darfur, 428
Ninchen-Tangla Range, Tibet, 467
Nisíbin or Nesíbin, 658
Niuafóu, Island of, letter from Coutts Trotter on the, 210
———, South Pacific, Account of a Visit to, by Lieut. B. T. Somerville, 65 *et seq.*
Nivelamentos de precisão eda sua superficie de referencia, by C. d'Avila (New Publications), 117
Nodushan, Persia, 170
Nogues, M., La puissance maritime de l'Angleterre et l'importance de Madagascar (New Publications), 214
Nordenskiöld, G., Om Björlings och Kallstenii expedition (New Publications), 447
Nordenskjöld, O., Eldslandet (New Publications), 445
Norderney, New Publications—
Blumen . . . der Insel Norderney, von C. Verhoeff, 439
Norikura, Japanese Alps, 127, 128
Norikuravu hot springs, Japan, 148
Norman, Sir H. W., A West India Island (New Publications), 335
———, Capt. Cook and his First Voyage, etc. (New Publications), 336
Noronha, E. de, Esboço da Carta do Districto de Lourenço Marques (New Maps), 687
North-East Passage, Story of the (New Publications), 447
North Pole, M. Andrée's proposed balloon voyage to the, 206, 325
———, Dr. Nansen's Expedition to the, 317, 433, 436, 555
North Pole to Equator, From, by A. E. Brehm; translated by M. R. Thomson (New Publications), 686
North Sea, The Movements of the Surface Waters of the, by H. N. Dickson, 255 *et seq.*
Norway, New Publications—
Die Norwegische Commission der Europäischen Gradmessung, 109
Hydrografisk-biologiske studier over norske fiskerier, af J. Hjort, 221
Jahrbuch des Norwegischen Meteor. Instituts für 1892, von Dr. H. Mohn, 676
Sydvestlige Norges anthropologiske forhold, ved C. Arbo, 439
Varangerfjord Region, etc., by H. Reusch, 439
Norway, Photographs of, by Capt. Mockler-Ferryman, 344
Nott, Lewis, The Upper Niger and Sudan (New Publications), 333
Nova Scotia, Messrs. Fletcher and Faribault's work in, 414
Novaya Zemlya, M. Chernyshev's expedition to, 206, 425
Nutt, W. H., Journey to Lake Rukwa, 427
Nyasa districts, slave trade in the, 380, 382
—— lake, desiccation and depths of, 368; volcanic region of, 369
Nyenchen-tang-la, Tibet, 482
Nysa, ancient city and people of, 45

O.

Oates, W. E., Obituary of, 667
Ob bay and river, explorations of the, 545, 546
Obermair, L., Zur alpinen Kartographie (New Publications), 218
Obrucheff, B. W., expedition in Siberia, 95
———, Orography of Central Asia (New Publications), 440
———, Verwitterungs . . . in Central-Asien (New Publications), 562
Ocean-currents, 268
Ocean-level, changes in, 231
Ocean Ro[illegible]ew Publications—
Fast Passages and Best Routes, by W. Allingham, 571
Oceanic Circulation, New Publications—
Specific Gravities and, by A. Buchan, 683
Oceanic water in the North Sea, 258
Oceans, New Publications—
Note sur l'histoire des océans, par M. Suess, 338
Octodontidæ of Africa, 285
Odoric, Friar, Island of Dondin of, 659
Ogowé river and delta, Miss Kingsley's Travels on the, 95
Ohlin, A., Nagra anteckningar . . . i Norra Ishafvet (New Publications), 447
Oliver, Capt. P., French Progress in the Western Soudan (New Publications), 214
———, The African Pioneers (New Publications), 331

Olsen, O. T., The Fisherman's Nautical Almanac, etc. (New Publications), 224
Oman, Journal of an Excursion in, by Col. S. B. Miles, 522 *et seq.*
Ontake Peak, Japanese Alps, 144
Ontario, Western, Mr. McInnes' work in, 413
Oporto, New Publications—
Relatorio . . . da Associaçao Commercial do Porto, by A. da F. Menéres, 439
Oppel, A., Die Zahl der Weissen im tropischen Amerika (New Publications), 217
———, Übersichten der Wertschaftsgeographie (New Publications), 683
Oppenheim, Freiherr v., Journey from Damascus to Bagdad, 548, 658
———, Routenkarte einer Reise von Damaskus nach Bagdad (New Maps), 687
Ordnance Survey, Geographical Description of the British Islands, based on the, by Dr H. R. Mill, 345 *et seq.*
Ordnance Survey Maps (New Maps), 120, 225, 341, 449, 572, 686
Oritæ, ancient tribe, 389
Orleans, Prince Henry of, Du Tonkin au Yunnan (New Publications), 212
———, Journey from the Mekong to Assam, 93, 199, 300, 675
Ossat, Angelis d', Storia fisica dell Agro-Romana (New Publications), 561
Østrup, J., Historisk-topografiske . . . den Syriske ørken (New Publications), 678
O'Sullivan, Mr., explorations in Canada, 315
Ottawa district, geological survey of, 413
———, fertile region north of, 315
Oudemans, J., Longitude de Batavia (New Publications), 330
Ouseley, Sir W., on the island of Kais, 645, 648

P.

Pacific, Deep Soundings in the, obtained by Commander Balfour, 318
———, South, Niuafóu Island in the, 65 *et seq.*
Pacific, New Maps—
Pilot Charts of the North Pacific, 124, 228, 452
Stiller Ozean, Ein Atlas von 31 Karten, Herausgegeben von Dr. Neumayer, 688
Pacific, New Publications—
Parts of the Pacific, 336
Pacific Coast, New Publications—
Topography of the, by J. S. Diller, 216
Pahde, Dr., Erforschung des Kongo-Systems (New Publications), 113
Paiva, A. de, Expediçao ao Bihé (New Publications), 214
Palatinate, New Publications—
Die bayerische Pfalz, von Dr. A. Geistbeck, 676
Palaung tribe, 596
Palestine, New Publications—
Archæological Researches in, 1873-74, by C. Clermont-Ganneau, 678
Palmer's land, Antarctic, 628
Palóczy, Prof., Prof. L. v. Lóczy (New Publications), 339
Pamir Boundary Commission, route and geographical work of, 91
———— Delimitation, Preliminary Report, etc., by Col. Holdich (New Publications), 441
Pamir plateau, 462
Panama Canal Route, by R. T. Hill (New Publications), 445
Panckow, H., Die Bevölkerung Formosas (New Publications), 330
Pando, Col., exploration of the Madre de Dios, 187
Pandomanagai, dwarf race, 390
Pangani, Reisebriefe . . . am, von G. Meinecke (New Publications), 442
Pangong lakes, Tibet, 477
Panjgur, topography of, 670
Panjkora river, 43
Paraguay and Bolivia frontier, Dr. Polakowsky on the, 205
Paraguay, New Publications—
Bureau of American Republics, Bulletin of, 681
Nueva Geografia Universal, por E. Reclus; Prólogo, etc., por R. de Olascoaga, 565
Parallaxes in Declination, Diagram for determining the, by Major S. Grant, 649
Paris Geographical Society, Awards of, 664
Parsis of Persia, 28, 29, 171
Partsch, Dr., 'Silesia,' Review of, 417
Pasquier, L. du, Glaciers et periode glaciaire (New Publications), 567
Passarge, Dr S., Reiseroute der Expedition des Deutschen Kamerunco mités (New Maps), 451
————, Adamaua, Review of, 272
Patent Laws of all Countries, Gleanings from, by W. L. Wise (New Publications), 685
Patkoi range, expeditions across the, 202
Paulet island, Antarctic, 697, 629, 635
Paulitschke, Dr., Die heutige Lage der Italiener in Abessinien (New Publications), 442
Paulitschke, P., Der sechste internationale geographische Congress zu London (New Publications), 685
Paulsen, A., Effet de l'humidité, etc., sur l'aurore boréale (New Publications), 448
Payer, J. von, letter from, on his map of Franz Josef Land, 105
Payer, R., Naturstudien über das östliche Peru (New Publications), 217
Paz, Dr. Ramon, exploration of the Madre de Dios, 188
————, De Riberalta al Inambari (New Publications), 217

Peale, A. C., Natural Mineral Waters of the United States (New Publications), 114
Pearsall, H. D., The Nile Reservoirs (New Publications), 214
Peary's Arctic Journey, New Publications—
Det Arktiske problem og de to Peary-expeditioner, by E. Astrup, 117
Peek, C. E., Meteorological Observations for 1894, Rousdon Observatory (New Publications), 110
Peer's Gill ravine, Lakeland, 620
Peipus lake, M. Spindler's observations on, 655
Pelagosa, New Publications—
Die Inselgruppe Pelagosa, von M. Groller, 326
Peloponnes, New Maps—
Vegetations-Karte des, von Dr. Philippson, 226
Peloponnes, New Publications—
Vegetationskarte des, von Dr. Philippson, 211
Peloponnesus, vegetation of the, Dr. Philippson on, 426
Penck, Prof. A., Die Etsch (New Publications), 109
Pendulums, horizontal, records of, 252
————, Dr. Rebeur-Paschwitz on, 219
Penguins of the Antarctic, 518
Pennine chain, origin of the, 604
Pennsylvanian Forests, by Dr. Rothrock (New Publications), 216
Penzler, J., Geographisch-statistisches Lexikon über die Erdteile (New Publications), 684
Perceval, Sir W. B., Remarks on "First Crossing of the Southern Alps of New Zealand," 500
Pereira, J. E., A Industria agraria (New Publications), 109
Periodicals of 1894, Index to the, by Miss Hetherington (New Publications), 223
Persia, Journeys in (1890–91), by Capt. Vaughan, 24 *et seq.*, 163 *et seq.*
Persia, New Publications—
Mission Scientifique en Perse, par J. de Morgan, 112, 331
Persian Gulf, Ancient Trading Centres of the, by Capt. A. Stiffe, 644
Peru, New Maps—
Mapa del Peru, A. Raimondi, 121
Peru, New Publications—
Beobachtungen und Studien, etc., von G. W. Middendorf, 335
Biblioteca Peruana, 570
Bureau of the American Republics, Bulletin No. 69..335
Coast Desert of, by A. F. Sears, 217, 445
Der Amazonas, Wanderbilder aus Peru, etc., von D. von Schütz-Holzhausen, 335
Naturstudien über das ostliche Peru, von R. Payer, 217
Peruvian Expedition to the Madre de Dios, 189
Peters, Dr. C., Aequatorial- und Süd-Afrika nach einer Darstellung von 1719 (New Publications), 214; note on, 202
Petersen, J., Die Erforschung des Dirk Gerritsz-Archipel (New Publications), 447
Petherick, E. A., The Torch and Colonial Book Circular (New Publications), 223
Petroff, Lieut.-Gen., expedition in Siberia, 94
Pettersson, Prof. O., surveys in the North Sea, 256
Pfeil, J. Graf von, Der Ochsenwagen in Ostafrika (New Publications), 213
Philip, G., Eight small historical globes (New Maps), 343
————, Special Map of British Guiana (New Maps), 342
Philippi, Dr. R. A., Bermerkungen . . . Verschiedenheit zwischen Patagonien and Chile (New Publications), 680
Philippine Islands, New Publications—
Estudios para una Nosologia Filipina, por E. M. Barcones, 112
Philippson, Dr. A., Die neueren Forschungen . . . den Bau der Erdkruste (New Publications), 220
————, on the Vegetation of the Peloponnesus, 426
————, Reisen . . . in Nord-Griechenland (New Publications), 439
————, Vegetations-Karte des Peloponnes (New Maps), 226
————, Zur Vegetationskarte des Peloponnes (New Publications), 211
Phillipps-Wolley, Clive, Big Game Shooting (New Publications), 224
Phillips, W., Climate and Health of the United States (New Publications), 216
Phœnician Characters from Sumatra in the Pitt-Rivers Museum (New Publications), 212
———— in Sumatra, 659
Photographie en océanographie, par M. Thoulet (New Publications), 337
Photographs—
Asia Minor, North-West, by Messrs. Munro, Anderson, and Anthony, 344
Holub, Dr. Emil, Südafrikanische Ausstellung, 124
New Zealand, Southern Alps of, by E. FitzGerald, 576
Norway, by Capt. Mockler-Ferryman, 344
St. Helena, by Col. Swinton, 688
Spitzbergen, by Mr. Corbett and Lieut. Drummond, 576
Photography, Application of, to Topographic Surveying, by G. Heimbrod (New Publications), 567
Phrygia, Prof. Ramsay's work on, review by Sir C. W. Wilson, 190
Phrygie, En, par M. Radet (New Publications), 329

Physiography, Major Powell on, 319
Physiography, by J. W. Redway (New Publications), 338
Piaggia, Carlo, In Memoria di, by F. Bonola Bey (New Publications), 222
Pickering, W. A., The Straits Settlements (New Publications), 331, 678
Pike's Expeditions to Headwaters of the Mississippi, etc., edited by E. Cones (New Publications), 444
Pilcher, Mr., on the Shan people, 591
Pilcomayo river, hydrographical conditions of, 84; shallowness of, 87; swamp on, 88, 89
————————, Journeys and Explorations on the, by Lieut. Storm, 82
Pilcomayo, New Publications—
El Rio Pilcomayo y el Chaco Boreal, por O. J. Storm, 334
Pinnacle mountain, Canadian Rockies, 53
Pir-Hajat, Persia, 40
Place-Names, New Publications—
Irrégularités orthographiques des noms de lieux, par M. Barbier, 222
Ueber die Schreibweise von Ortsnamen, von P. Staudinger, 222
Plant Distribution, Some Curious Facts in, by W. Botting Hemsley (New Publications), 338
Plants, New Publications—
Aufgaben der Pflanzengeographie, von A. F. Schimper, 683
Les plantes de la région alpine, etc., par G. Bonnier, 118
Select Extra-Tropical Plants, etc., by Baron von Mueller, 221
Plarr, V. G., Men and Women of the Time (New Publications), 119
Platter, J. C., Schlösser und Burgen in Tirol (New Publications), 107
Platz, E., Studienfahrten im Gebiete der Vomperkette des Karwendelgebirges (New Publications), 107
Playfair, Sir Lambert, Handbook for Travellers in Algeria and Tunis (New Publications), 213
Pleyte, C. M., De Verkenning der Bataklanden (New Publications), 331
Ploix, Ch., par H. Cordier (New Publications), 223
Plumandon, J., Variations de la vitesse des vents, etc. (New Publications), 220
Polakowsky, Dr., Die Grenze zwischen Mexico und Guatemala (New Publications), 115
————————, Die Zustände auf der Oster-Insel (New Publications), 217
————————, on the Bolivia-Paraguay Frontier, 205
Polar Expedition, New Publications—
Förslag till polarfärd met luftballong, af S. A. Andrée, 567
Några skildringar från den Wellmanska, af H. Wästfält, 567
Polar streams, 265
Polarforschung, Der gegenwärtige Standpunkt der, von Dr. E. von Drygalski (New Publications), 337
Pomba, C., L'Aspect physique de l'Italie, relief à surface convexe (New Publications), 108
Pomian, A. H. de, Dahome, land och folk (New Publications), 563
Pontine Marshes, The, by F. von Donat (New Publications), 439
Porena, Prof., Un cartografo Italiano (New Publications), 221
Portugal em Africa, Padroado de, by Rev. de Himeria (New Publications), 443
Portugal, Proposed Vasco da Gama Celebration in, 103
Portugal, New Publications—
A Industria agraria, por J. Esteves Pereira, 109
Portuguese discovery of the Moluccas, 365
Portuguese knowledge of Africa in 16th and 17th centuries, 202
Poskin, Dr. A., Climatologie du Congo (New Publications), 332
Poso Lake, Celebes, 205
Powell, B. Baden, A Trip Heavenward (New Publications), 119
Powell, Major, on physiography, 319
Preller, Dr. du Riche, on Glaciation, etc., of subalpine Switzerland, 655
Price, Rev. F. M., Notes on Ruk and the Mortlock Islands (New Publications), 116
Prielmayer, M. v., Die Granatspitzgruppe in den Hohen Tauern (New Publications), 106
Princesse-Alice, Sur la deuxième campagne scientifique de la, par le Prince de Monaco (New Publications), 220
Prince's Island, fauna of, 283
Privat-Deschanel, P., La fixation des dunes au Sahara (New Publications), 443
Probyn, L. C., Gold . . . of the World (New Publications), 340
Prussia, New Publications—
Quer durch Preussisch-Litauen, von D. F. Tetsner, 676
Prutz, H., Gustav Hirschfeld (New Publications), 222
Pteropus of Madagascar, 288
Ptolemies, The Empire of the, by J. P. Mahaffy (New Publications), 332
Ptolemy, Claudius, and his Works, by W. T. Lynn (New Publications), 569
Puelo, Rio, Die Erforschung des, von Dr. Steffen (New Publications), 115; note on, 101
Punjab, New Publications—
Gazetteer of the Sialkot District, by Capt. Dunlop Smith, 678
Hill Life in the Afghan and Hindu Highlands of the, by F. St. J. Gore, 330
Irrigation, by Sir J. Lyall, 441
Report on Administration of the Punjab and Dependencies, 563
Purari River, Discovery of the, by T. Bevan (New Publications), 218

Pyrenees, New Publications—
Los ferro-carriles del Pirineo, por Jiménez y Lluesma, 677
Recherches, etc., dans les Pyrénées centrales, par E. Belloc, 109
Sur l'étendue des glaciers des Pyrénées, par M. Schrader, 109

Q.

Quebec, province of, Dr. R. Bell's work in, 413
Quebec, New Publications—
Reports of the Commissioner of Crown Lands, 444
Queensland, New Publications—
Annual Progress Report of the Geological Survey for 1894..116
Report on the Leichhardt Gold Field, etc., by W. H. Rands, 218
Travel and Adventure in Northern Queensland, by A. C. Bicknell, 336
Quevedo, S. A. F., Notas Arqueológicas . . . objeto de arte indígena (New Publications), 444

R.

Races Jaunes, Considérations générales sur les, by Dr. Hamy (New Publications), 221
Radde, Dr., and E. Koenig, Der Nordfuss des Dagestan (New Publications), 327
———, Besuch auf Buton and Süd-Celebes (New Publications), 563
———, Eine Woche in Ceylon (New Publications), 562
———, Karte des nordöstlichen Kaukasus (New Maps), 225
Radet, M., En Phrygie (New Publications), 329
Radmore, John R., honour to, 556
Rafaï, le sultan, Deux années . . . chez, par Ch. de la Kéthulle (New Publications), 331
Raimondi, A., Mapa del Peru (New Maps), 121
Rainaud, M. A., La Pentapole cyrénéene et la colonisation (New Publications), 113
Rains, New Publications—
How Nature Regulates Rains, by R. L. Fulton, 683
Rainy Lake Gold Region, Report on the, by Winchell and Grant (New Publications), 334
Raml, Wadi, Tripoli, 151
Ramsay, Prof., Work on Phrygia, Review by Sir C. W. Wilson, 190
Rançon, Dr. A., La Flore utile du Bassin de la Gambie (New Publications), 564
Rand, McNally and Co., Indexed Pocket Maps of British Columbia and Quebec (New Maps), 451
———, Indexed Pocket Maps of the United States (New Maps), 451
Rands, W. H., Report on the Leichhardt Gold Field, etc., in Queensland (New Publications), 218
Raritan Bay and the Delaware, Canal between, 554
Rasak, Makran, 402, 403
Rask, ancient town of, 671, 672
Raskan-darya, Central Asia, 197
Ratzel, F., The History of Mankind (New Publications), 118
Ravenstein, E. G., remarks on "Proposed Geographical Description of the British Islands," 359
Raverty, Major, "Notes on Afghanistan," 547
Rawalpindi District, Gazetteer of the (New Publications), 441
Rawlinson, Sir H., by M. Paul Chaix (New Publications), 119
———, Notice sur, by Henri Cordier (New Publications), 119
Ray, S. H., Texts in the Languages of the Bismarck Archipelago (New Publications), 218
Rebeur-Paschwitz, Dr., Horizontalpendel-Beobachtungen (New Publications), 219
———, Vorschläge zur Errichtung . . . Erdbeben - Stationen (New Publications), 220
Réclus, E., Projet de construction d'un Globe Terrestre à l'échelle du Centmillième (New Publications), 117
——— and Olascoaga, Paraguay (New Publications), 565
Red Sea, New Publications—
Currents in the, by Capt. Hood, 221
Redway, J. W., What is Physiography? (New Publications), 338
Reichard, P., Zur Frage der Austrocknung Afrikas (New Publications), 112
Reiche, Dr., Die Thermen von Chillan in Chile (New Publications), 335
Rein, Prof. J. J., Fortentwicklung . . . des japanischen Kunstgewerbes (New Publications), 441
Reina, V., L'attrazione locale nella Specola geodetica di S. Pietro in Vincoli (New Publications), 219
Reindorf, C. C., History of Gold Coast and Asante (New Publications), 564
Reinhertz, Dr. C., Die Schätzungsgenauigkeit an Maassstäben (New Publications), 447
Rejang, Phœnician characters in, 659
Renaud, G., Les Travaux publics et les Chemins de fer au Tonkin (New Publications), 111
Rendle and Levat, Report on Solfataras . . . of Vanua Lava (New Publications), 566
Réunion Island, Fauna of, 284
Reusch, H., Folk og natur i Finmarken (New Publications), 328
———, The Varangerfjord Region and the Forthcoming Solar Eclipse (New Publications), 439

Reykjanes, New Publications—
Dr. Thoroddsen's Forschungen auf Reykjanes, 328
Reynolds-Ball, E. A., Mediterranean Winter Resorts (New Publications), 685
Rey-Pailhade, J. de, Le temps décimal (New Publications), 117
Rhode, J. J., Argentisch-chilenischen Grenzstreit (New Publications), 680
Riban, Ch., La Tunisie, Histoire de la Colonisation (New Publications), 215
Ribbe, Carl, Reisen in der Südsee, von Dr. Schneider (New Publications), 330
Ricchieri, Prof., VI. Congresso Geografico Internazionale di Londra (New Publications), 341
Richards, Admiral Sir G. H., Report of Navigation of River Mersey (New Publications), 561
Richter, J., Der Streit um die Mosquito-Küste (New Publications), 445
Rickmers, W. Rickmer, Ararat (New Publications), 110
Riesengebirge, New Publications—
Hohenbestimmungen . . . im Riesengebirge, von Dr. A. Galle, 676
Rig-i-Chichagun, Persia, 33
Riley, F. L., Colonial Origins of New England Senates (New Publications), 679
Rinds of Baluchistan, 391, 392
Ripol, J., Calcul rigoureux du point à la mer par deux hauteurs quelconques (New Publications), 337
Ritters geographisch-statistisches Lexikon, von J. Penzler (New Publications), 684
Rivers, ancient origin of, 622
Riviera, The, by Ch. Lenthéric, translated by Dr. West (New Publications), 212
Riviere, Capt., death of, 599
Robinson, Rev. C. H., Hausaland; or, Fifteen Hundred Miles through Central Soudan (New Publications), 215, 443
Robinson, Sir W., Western Australia (New Publications), 116
Roborovsky, Capt., expedition to Tibet, 94
Rock structure in Lakeland, 612
Rocks, An Introduction to the Study of (New Publications), 448
Rocky Mountains, Canadian, 49; history and geology, 52; glaciers, 56; flora and fauna, 58, 60; meteorology, 61; snowfall of, 62; forest fires, 62; surveys, 63
Rodents of the Ethiopian Region, 285
Rodriguez island, fauna of, 284
Rodway, J., Old Boundary of Essequibo (New Publications), 565
————, West Indies and Spanish Main (New Publications), 566
Rogers, A., The Province of Gujarát (New Publications), 677
Rosén, P. G., Telegraphische Längenbestimmungen zwischen Lund, Göteborg (New Publications), 109
————, Untersuchungen . . . der Grube Sala (New Publications), 337
Rosthorn, A. von, journey in Western China, 201
Rosthwaite alluvial plain, 616
Rotation of the Earth, New Publications—
M. Andrade's works on, 219
M. Coret's work on, 219
Roth, H. Ling, on the name of Dyak (Dayak), 432
Rothrock, Dr., Our Pennsylvanian Forests (New Publications), 216
Rouire, Dr., La Colonie portugaise d'Angola (New Publications), 215
Rousdon Observatory, Devon, Meteorological Observations for 1894, by C. E. Peek (New Publications), 110
Rousselet, L., Nouveau Dictionnaire de Géographie Universelle (New Publications), 684
Roux, E., Lettre sur le Yunnan (New Publications), 329
Roy, J. E., Le baron de Lahontan (New Publications), 222
Royal Geographical Society—
Afternoon Technical Meetings, 106, 437, 559
Educational lectures by Mr. Mackinder, 91
Educational prizes, award of, 425, 544
Honours to the President of, 90, 654
Legacy from Mr. Chandless to, 655
Medals, royal, and other awards for 1896..654
Meetings of, Session 1895–96..105, 106, 211, 325, 436, 437, 559, 560, 675
Ruapehu, New Publications—
Early Ascent of, by Th. Allison, 116
Ruapehu: Retrospect and Prospect, by H. Hill, 116
Rubel, O., Die Niederschlagsverhältnisse im Ober-Elsass (New Publications), 327
Rud-i-Ax-i-Rustam river, Persia, 26
Rudok, Tibet, 477
Rüge, Dr., Das unbekannte Südland (New Publications), 221, 337
Ruk and the Mortlock Islands, Notes on, by Rev. F. M. Price (New Publications), 116
Rukwa, Lake, Mr. Nutt's journey to, 427
Rumpelly, R., J. Wolff, and T. N. Dale, Geology of the Green Mountains in Massachusetts (New Publications), 216
Rungwe volcano, Central Africa, 370
Rusden, G. W., History of New Zealand (New Publications), 446
Ruspoli, E., by Prof. E. Millosevich (New Publications), 223
Russell, I. C., Influence of débris on the flow of glaciers (New Publications), 220
————, Reports on the Conference of Geography at Chicago, 434
Russia, New Publications—
Bibliothèque Géologique de la Russie, 1894, by S. Nikitin, 676
Die Entstehung der Limane Südrusslands, von N. Sokolow, 677

Russia, New Publications—*continued.*
Die Seen der Gouvernements Twer, Pskow und Smolensk, von Krahmer, 109
Distribution du vent . . . dans l'Empire Russe, par J. Kiersnowsky, 677
La colonisation russe contemporaine le long de la Volga, par M. d'Almeida, 109
L'écorce terrestre dans la Russie d'Europe, par M. Karpinsky, 328
Russia in Europe, by Hon. G. Hubbard, 439
Russian Geographical Society, Jubilee of, 310
Ruwenzori mountain, 660
Ryder, C., Isforholdene i Nordhavet (New Publications), 447
Ryder, M. C., Observations . . . dans le Scoresby Sound (New Publications), 682

S.

Sacken, C. R. Osten, The Bugonia-Lore of the Ancients (New Publications), 224
St. Helena island, fauna of, 283
————, photographs of, by Colonel Swinton, 688
St. Helena, New Publications—
Die zoogeographische Stellung der Insel St. Helena, von Dr. W. Kobelt, 679
Notes on Fisheries, etc., of, 215
St. John valley, Lakeland, 616
St. Lawrence, New Publications—
Pleistocene Marine Shore-line on South Side of, by R. Chalmers, 679
Saint-Martin and Rousselet, Dictionnaire de Géographie, Note on, 415
St. Thomas island, fauna of, 283
St. Thomé, A provincia de, A. de Castilho (New Publications), 443
Sahara, New Publications—
De Dakar au Cap Juby, 443
Dunes au Sahara, par M. Privat-Deschanel, 443
Saharan Subregion of the Geography of Mammals, 293
Sakhalin, peat-formation in, 423; races of, 424
————, The Island of, by Prof. von Krasnow, 422
Sakkara tribe, 428
Sakkelionos, Greek Bibliography (New Publications), 223
Saluga, Niger basin, 97
Salamander, giant, of Japan, 137
Sali town, 549
Salonga river, Central Africa, 203
Salt deserts of Persia, 165–167
Salt lake, Persia, 169, 170
Salt-making in Central Africa, 373
Salvador, New Publications—
Bureau of American Republics, Bulletin of, 681
Salwin, source of the, 308
————, affluents of the, 580
————, width and depth of the, 582
Salwin to Khamti, Prince Henry of Orleans' route from, 304
Samnan, height of, 166
Samoa, New Publications—
Samoa die Perle der Südsee, von O. Ehlers, 336
San Carlos, New Publications—
Topográfico y Geológico de, 444
San Luis, New Publications—
Excursion en la Provincia de, por Dr. Valentin, 445
Sana Kachins, N. E. India, 93
Sanchez, A., La Cornoide (New Publications), 567
Sandhills in Tibet, 457
Sandhills of Persia, 39, 40
Sanga basin, M. Wauters' map of the, 552
Sanga, New Publications—
La Haute-Sangha, par Ed. Ponel, 114
La Rivière Sanga, par A. J. Wauters, 442
Sango village, position of, 429
Santals, New Publications—
Om Santalfolket, etc., af E. Heuman, 563
Santo Domingo, New Publications—
Bureau of American Republics, Bulletin of, 681
Sa On, subterranean river at, 581
Sapper, Dr., Beiträge zur Ethnographie von Südost-Mexiko und Britisch-Honduras (New Publications), 115
Sarasin, F. and P., explorations in Celebes, 205
————————, Reiseberichte aus Celebes (New Publications), 212, 678
Saurin, J., La colonisation française en Tunisie (New Publications), 215
Saxony, New Publications—
Waldungen des Königreichs Sachsen, von H. Gebauer, 328
Sayce, Rev. A. H., The Egypt of the Hebrews and Herodotus (New Publications), 213
Schimper, A. F., Aufgaber der Pflanzengeographie (New Publications), 683
Schiötz, O. E., Resultate in dem südlichsten Theile Norwegens ausgeführten Pendelbeobachtungen (New Publications), 109
Schirmer, H., Les Traités de Partage de 1894 en Afrique Centrale (New Publications), 442
Schizocodon soldanelloides, 136
Schmidel, Ulrich, por B. Mitre (New Publications), 569
Schmidt, Dr. A., Erdmagnetismus und Erdgestalt (New Publications), 338
————————, Vertheilung des erdmagnetischen, etc. (New Publications), 449
Schmidt, Prof. Vald, Hvor lan det gamle Gosen (New Publications), 563
Schmitt, R. H., Colonisations project der Freiländer (New Publications), 571
Schneider, A., Stadtumfänge in Altertum und Gegenwart (New Publications), 339
Schneider, Dr., Carl Ribbes Reisen in der Südsee (New Publications), 330

Schomburgk, Sir Robert, boundaries laid by, 280, 309
————————, explorations in British Guiana, 101
Schools, Secondary, Geography in, 208
Schott, Dr., Hydrographie . . . der Ostsee (New Publications), 448
Schrader, F., Atlas de Géographie Historique (New Maps), 228, 574
————————, Atlas Universel de Géographie (New Maps), 343
————————, L'Année Cartographique (New Maps), 342
————————, Nouvel instrument servant au trace direct, etc. (New Publications), 219
————————, Sur l'étendue des glaciers des Pyrénées (New Publications), 109
Schulatlanten, Spezialkärtchen in useren, von Dr. Hözel (New Publications), 684
Schütz-Holzhausen, D. von, Der Amazonas (New Publications), 335
Schwabe, Dr., Bericht über die Gesundheitsverhältnisse der Marshall Inseln (New Publications), 218
Schwarzburg-Sondershausen, Die Wald- und Wasserverhältnisse des Fürstentums, von Dr. Toepfer (New Publications), 108
Schweiger-Lerchenfeld, A. v., Die Donau als Volkerweg (New Publications), 327
Schweinfurth, G., Ein altes Heiligtum an den Ufern des Möris (New Publications), 214
————————, Die Wiedergeburt Aegyptens (New Publications), 221
Schwere in der Grube Sala, Untersuchungen über die, von P. G. Rosén (New Publications), 337
Schwérer, A., Étude sur la loi des tempêtes (New Publications), 220
Scientific Papers, Catalogue of, by Royal Soc. of London (New Publications), 570
Sclater, Capt., journey from Mombasa to the Victoria Nyanza, 662
Sclater, W. L., The Geography of Mammals, No. IV., 282 *et seq.*, 435
Scordale, Lakeland, 609
Scoresby Sound, New Publications—
Observations . . . dans le Scoresby Sound, by M. C. Ryder, 682
Scotland, New Maps—
The Royal Scottish Geographical Society's Atlas of, by J. G. Bartholomew, 120
Scotland, New Publications—
Archæological Notes on Early Scotland, by W. G. Don, 562
The Frost of 1895 in, by R. C. Mossman, 677
Scott, J. G., Remarks on "The Country of the Shans," 600
Scriven, Capt. G. P. Report on Nicaragua Canal (New Publications), 565
Seals and Whales in the Antarctic, 516, 627
Sears, Major, The Coast Desert of Peru (New Publications), 217, 445
Seebohm, Henry, Obituary of, 103
————————, Sir G. Goldie's remarks on the death of, 211
Seeley, Prof., Remarks on "Proposed Geographical Description of the British Islands," 362
Ségou-Sikoro, De Marseille à, par R. Hacquart (New Publications), 214
Seidel, A., Geschichten und Lieder der Afrikaner (New Publications), 678
Seismographs, records of, 251
Seismological Society of Japan, 239
Seismology, value of, 238, 239
Selenoy, G. L., und N. v. Seidlitz, Die Verbreitung der Armenier in der asiatischen Türkei (New Publications), 440
Sella, A., Magnetismo terrestre sul Monte Rosa (New Publications), 449
Semenoff, M., jubilee speech to Russian Geographical Society, 310
Senegal, ports of, 314
Septfonds, Les Chapeaux de Paille de, par J. Gebelin (New Publications), 107
Sernander, R., Studier öfver den Gotländska vegetationens (New Publications), 328
Serrano, F., discovery of the Moluccas, 365
Seychelles Islands, fauna of, 283
Shaahbet el Khel, Tripoli, 156
Shabokoma, Lake, Canada, 315
Shahpur, Persia, 175
Shan Hills, The, by Col. Woodthorpe (New Publications), 441
Shans, Country of the, by Colonel Woodthorpe, 577 *et seq.*
Shan States, extent of, 578; description of country, 578; rivers, 578, 579; subterranean rivers, 581; animals of, 586; climate, 587; mists in the valleys in the, 587; people of the, 591, 596, 691; cultivation in the, 592
Shari, swamps of the, 271
Sharpe, Alfred, The Geography and Resources of British Central Africa, 366 *et seq.*
Shillingford, F. A., Changes in the Course of the Kusi River, etc. (New Publications), 212
Shinano-Hida range, Japan, 148
Shinano plain, archæological remains on, 148
Shinko river, Congo basin, 203
Ship Canal at the Iron Gates on the Danube, 544
Ship Canals in the United States, Projected, Dr. Deckert's account of, 553
Shir-Kuh, Persia, 30
Shirahoneyu hot springs, Japan, 148
Shire highlands, coffee-planting of the, 374; labour supply in the, 376; colonization of the, 380
Shiré river, changes of level of, 368
Shoals, Isolated, Improbability of finding, by G. W. Littlehales (New Publications), 448
Shunserab river, Kashgar range, 196

Sia and Tusayan Snake Ceremonials, by J. W. Fewkes (New Publications), 118
Siam and Indo-China, Boundary Treaties in, 297
Siam, New Publications—
Le Siam Ancien, Archéologie, etc., by L. Fournereau, 112
Notes on a Journey to . . . Siam, by H. Warington Smyth, 331
Siam: a geographical summary, by Mrs. Grindrod, 213
Sibal, Oman, 529
Siberia, Lieut.-Gen. Petroff's expedition in, 94
———, M. Obrucheff's expedition in, 95
Siberia, New Publications—
Der Kreis Surgut in West-Sibirien, von P. von Stenin, 331
Siberian Railway, progress of the, 311
——— rivers, mouths of the, explorations in 1895.. 545
Sibree and Baron, Revs., Antananarivo Annual and Madagascar Magazine (New Publications), 443
Sicily, New Publications—
La Sicile, par M. G. Vuillier, 328
Sieger, Dr., Karstformen der Gletscher (New Publications), 220
Sievers, Dr. W., Amerika, Eine allgemeine Landeskunde Herausgegeben von (New Publications), 215
———————, Australien und Ozeanien (New Publications), 335
———————, Die Grenzen Venezuelas (New Publications), 335, 446
———————, Zweite Reise in Venezuela (New Publications), 446
Sigiriya, New Publications—
Report of the Archæological Survey, by H. C. P. Bell, 562
Silesia, by Dr. Partsch, Review of, 417
Silesia, New Publications—
Das mittelschlesische, etc., von Dr. R. Leonhard und Dr. Volz
Silk cultivation in Japan, 139
Simon, Lieut., journey up the Mekong, 583, 586
Simons, F., Carta Corográfica del Departemento de Bolivar and Magdalena (New Maps), 228
Sinclair, Sir John, by Archdeacon Sinclair (New Publications), 634
Siouan Tribes of the East, by J. Mooney (New Publications), 216
Sis Salwin States, 590
Sistan, ancient town of, 397
Sitta, Prof. P., La colonizzazione dell' Africa tropicale (New Publications), 333
Slatin Pasha, Conférence faite à la Société Khédiviale de Géographie (New Publications), 214
———————, Fire and Sword in the Sudan (New Publications), 442
Slavery in Central Africa, 381, 409, 412
Smith, Capt., Gazetteer of the Sialkot District (New Publications), 678
Smith, Dr. G., Bishop Heber (New Publications), 119
Smith, G. H., The Theory of the State (New Publications), 685
Smulders, J., Kaart van de Zuid Afrikaansche Republiek (New Maps), 688
Smyth, H. Warington, Notes on a Journey to . . . Siam (New Publications), 331
Socotra, fauna of, 283
Sokaart-Archivets Antike Kaartsamling (New Publications), 119
Sokolow, N., Die Entstehung der Limane Südrusslands (New Publications), 677
Somaliland, Capt. Bottego's new expedition to, 99
Somaliland, New Maps—
Sketch of the Routes in, by Christie, Sparrow, and Mainwaring, 121
Somaliland, New Publications—
A trip in Somali Land, by Capt. Wellby, 113
Die deutschen Bestrebungen an der Somali-Küste, von C. von Bornhaupt, 113
Notizie della spedizione Bottégo, 679
Somaliland, Photographs of, by F. Gillett (New Maps), 452
Somerset, H. S., The Land of the Muskeg (New Publications), 114
Somerville, Lieut., Account of a visit to Niuafóu, South Pacific, 65 *et seq.*
Soudan: *see* Sudan
Soundings, Deep, in the Pacific, obtained by Commander Balfour, 318
Sous Terre, par E. A. Martel (New Publications), 221
Spain, New Publications—
Herbsttage in Andalusien, von G. Wegener, 440
Mission en Espagne, par M. du Dezert, 328
Regiones botánicas de la peninsula ibérica, por D. Lázaro e Ibiza, 677
Village Communities in, 109
Spamer's Grosser Hand-Atlas (New Maps), 574
Spanish claims in Guiana, 277, 278
Spears, J. R., The Gold Diggings of Cape Horn (New Publications), 335
Speech, The Expressiveness of, by A. R. Wallace (New Publications), 119
Spelæological Society founded by M. Martel, 434
Spelæology, New Publications—
Geographie und Höhlenkunde, von F. Kraus, 221
Sous Terre, par E. A. Martel, 221
Spencer, Dr., studies on the Great Lakes and Niagara, 204
———————, The Duration of Niagara Falls and History of the Great Lakes (New Publications), 115
Sperry, L. B., Avalanche Basin, Montana Rockies (New Publications), 444
Spielmann, Dr., Madagascar (New Publications), 443

Spindler, M., observations on Lake Peipus, 655
Spitzbergen, Sir Martin Conway's proposed expedition to, 555
Spitzbergen, New Publications—
En resa till norra Ishafvet, af A. Hamberg, 447
"Kane's" Reise langs Spitsbergens vestkyst af Trygve Heyerdahl, 117
Les Français au Spitzberg, par M. E. T. Hamy, 561
Om Spitsbergen og den Wellmanske polarexpedition af cand. real. H. H. Alme, 117
Spitzbergen, Photographs of, by Mr. Corbett and Lieut. Drummond, 576
Stadtumfänge in Altertum und Gegenwart, von A. Schneider (New Publications), 339
Stair, Rev. J. B., Floatsam and Jetsam from the Great Ocean (New Publications), 218
Stamboul: Old and New, by R. Davey (New Publications), 440
Stampede Pass, Cascade Range, by V. G. Bogue (New Publications), 444
Stanford's Compendium of Geography and Travel, vol. ii., South Africa, by A. H. Keane (New Publications), 113
Stanford's Map of Guiana and Venezuela (New Maps), 342
Stapf, Dr., on the flora of Mount Kinabalu, 431
Stars, New Publications—
Bearings of the Principal Bright Stars, etc., by A. C. Johnson, 447
State, The Theory of the, by G. H. Smith (New Publications), 685
Statistical Year Book of Canada (New Publications), 333
Statistics of Occupation, New Publications—
Zur Technik . . . Angaben, von Dr. Mayr, 569
Statistique, Bulletin de l'Institut International de (New Publications), 224
Staudinger, P., Ueber die Schreibweise von Ortsnamen (New Publications), 222
Steamships, manœuvring powers of, by Blackmore and Colomb (New Publications), 540, 571
Steffen and Krüger, Drs., exploration of the Rio Puelo, Chile, 101
Steffen, Dr., Chile und Argentinien in der patagonischen Kordillere (New Publications), 217
————, Die Erforschung des Rio Puelo (New Publications), 115
Steinbach, Dr., Die Gesundheitsverhältnisse, der Marshall Inseln (New Publications), 218
————, The Marshall Islands, 296
Steinhauer, I. S., First lessons in geography (New Publications), 224
Stenberg, E. G., Bidrag till Kännedomen om Fidjiboarnes (New Publications), 682
Stenin, P. von, Der Kreis Surgut in West-Sibirien (New Publications), 331
Stewart, Sir R. C., Remarks on "The Country of the Shans," 600
Stiffe, Capt. A., Ancient Trading Centres of the Persian Gulf, 644
Stone, Sir B., remarks on "Proposed Geographical Description of the British Islands," 358
Storch, Lieut., on the Ethnology of Usambara, 429
Storm, O. J., El Rio Pilcomayo y el Chaco Boreal (New Publications), 334
————, Journeys and Explorations on the Pilcomayo River, 82
Strahan, Aubrey, on the Carboniferous rocks of Lakeland, 603
————, Remarks on "The Waterways of English Lakeland," 623
Straits Settlements, New Publications—
Its Early History, by W. A. Pickering, 331
The Straits Settlements, by W. A. Pickering, 678
Stream-erosion curves in Lakeland, 621
Stream-lines, divergence of, in Lakeland, 619
Stream Measurements, Results of, by F. H. Newell (New Publications), 115
Street, A. H., Return of Wrecks and Casualties in Indian Waters (New Publications), 678
Strike-valleys of Lakeland, 613
Stromö, Færoes, 18
Strozzi, Andrea, by G. Uzielli (New Publications), 119
Stuhlmann, Dr., Ueber die Ulugururberge in Deutsch-Ostafrika (New Publications), 214; note on, 314
Sty Head Tarn, Lakeland, 616, 620
Suaheli, Aus dem Lande der, von G. Meinecke (New Publications), 442
Submarine Cables of the World, by G. Herrle (New Publications), 685
Submarine Peaks, Form of, by G. W. Littlehales (New Publications), 338
Sudan, Central, New State of Belda in the, 313
Sudan, New Maps—
Carta del Teatro della guerra nel Sudan Egiziano, 687
Sudan, New Publications—
Fire and Sword in the, by Slatin Pasha, 442
French Progress in the Western Soudan, by Capt. P. Oliver, 214
Hausaland, by Rev. C. H. Robinson, 443
Le campagne 1892-93 au Soudan français, par M. Archinard, 332
Tripoli et les voies commerciales du Soudan, par J. B. d'Attanoux, 333
Upper Niger and Soudan, by L. Nott, 333
Suderö, coal in, 5
Suess, Prof., Note sur l'histoire des océans (New Publications), 338

Sugar-producing Colonies, Future of our, by J. C. Williams (New Publications), 341
Sulphur springs and baths in the Japanese Alps, 132–134
Sumatra, Batak-Land in, 76 *et seq.*
———, Phœnician characters in, 659
Sumatra, New Publications—
De verplaatsing van eenige Triangulatie-Pilaren in de Residentie Tapanoeli, door J. Muller, 212
Phœnician characters from, 212
Supan, Dr. A., Grundzüge der physischen Erdkunde (New Publications), 221
———, Verteilung der Armenischen Bevölkerung in Türkisch-Armenien, etc. (New Maps), 342
Surveys, New Publications—
Report of U.S. Coast and Geodetic Surveys, 567
Surface Waters of the North Sea, The Movements of the, by H. N. Dickson, 255 *et seq.*
Surrey, New Publications—
Highways, etc., of, by C. Barrett, 328
Survey of India Department, Report on the Operations of the (New Publications), 330
Sutherland, New Publications—
Geology and Scenery of Sutherland, by H. M. Cadell, 561
Sutton, W. J., Report on Mining Section in Alberni District (New Publications), 564
Svinö, circular holes in cliffs of, 4
Swahili slave traders, 409, 412
Sweden, measurements for sea-level in, 234
Sweden, New Publications—
Determinations des éléments magnétiques . . . en Suède, par V. Carlheim-Gyllenskköld, 328
Om några genombrottsdalar . . . fjälltraker, af A. G Högbom, 561
Om sveriges zoologiska hafsstation Kristineberg, af H. Théel, 109
Sverige i utländska Kartverk, af H. Bystrõm, 561
Telegraphische Längenbestimmungen, von P. Rosén, 109
Sweny, Lieut. M., Sketch of Sea Approaches to Mersey (New Publications), 561
Swettenham, F. A., Malay Sketches (New Publications), 330
Swinton, Col., Photographs of the Island of St. Helena, 688
Switzerland, Glaciation and Lake-Basins of Subalpine, Dr. du Riche Preller on, 655
Switzerland, New Maps—
Topographischer Atlas der Schweiz, 226
Switzerland, New Publications—
Annuaire Statistique de la Suisse, 440
Syria, New Publications—
Historisk-topografiske, etc., af J. Østrup, 678
Szu-chuan province, Mr. von Rosthorn's journey in, 201

T.

Tabaran, ancient town of, 671
Tabbas desert and town, Persia, 38
Tafilet, by W. B. Harris (New Publications), 214; review of, 274
Taft, Persia, 29
Takalekajo mountains, Celebes, 205
Takla-Makan-Wüste, durch die, von Dr. Sven Hedin (New Publications), 110
Talamanca, New Publications—
Exploracion de Talamanca, por W. Gabb, 217
Talcahuano, El Puerto de, por A. Fagalde (New Publications), 115
Talifu, Prince Henry of Orleans' journey from, 300
Tamai, K., Eine japanische Reise um die Welt (New Publications), 225
Tanaka, Dr. S., Geschichtliche Verkehr Japans mit dem Auslande (New Publications), 563
Tang Aw on the Mekong, 583
Tanganyika Lake, Organisms of Marine Type in, 663
Tanganyika, meaning of word, 378
Tanganyika-Nyasa plateau, 372
Tarhuna and Gharian, Tripoli, Notes on a Journey in, by H. S. Cowper, 150 *et seq.*
———, lower slope of, 151; plateau, 152, 158; people, 153; tribes, 552
Tarhunis, Arab race, 153, 154
Tarnovski, Capt. G. V., Transcaspia and Khurasan (New Publications), 213
Tarr, R. S., Elementary Physical Geography (New Publications), 118
Tash-kurgan, earthquake shocks at, 196
Tasman, A. J., his life and voyages, by J. B. Walker (New Publications), 684
Tasman valley, New Zealand, 485
Tateyama hot springs, 130–132, 148
Taunggyi station, Shan States, 580
Taurong river, 200
Tay, Estuary of the, by D. Cunningham (New Publications), 110
Tay Firth, Antarctic, 634
Téglás, M. G., Neue Beiträge zur den Felsen-Inschriften der Katarakte in der untern Donau (New Publications), 107
Teheran, height of, 165
Tehuantepec Ship Railway, by E. L. Corthell (New Publications), 444
Tele Lake, Upper Niger, 99
Tembé, New Publications—
Une course au Tembé, par Henri Junod, 564
Tembi Kundu, position of, 313
Temperature in the Southern Hemisphere, 556
——— in the Great Southern Ocean, 539
——— of the air, balloon observations, 542

Tempêtes, Étude sur la loi des, par A. Schwérer (New Publications), 220
Temple, A. G., England's History as pictured by Famous Painters (New Publications), 677
Temple, Mount, Canadian Rockies, 50, 64
Teneriffe, New Publications—
Die Insel Tenerife, von Dr. H. Meyer, 113, 331
Tengri-Nor Lake, Tibet, 467
Terek pass, Tibet, 453
Tergelat, Wadi, 551
Termites, New Publications—
El rol de los Termitos, etc, por J. Koslowsky, 449
Terrestrial Magnetism, New Publications—
Die magnetische Declination, etc., von Dr. Weyer, 449
Loi de la distribution du magnétisme, by M. de Tillo, 219
Magnetismo terrestre sul Monte Rosa, by A. Sella, 449
On the Distribution . . . of Terrestrial Magnetism, by L. A. Bauer, 219
Sur la construction de nouvelles Cartes magnétiques, etc., by M. Bernardières, 219
The Earth a Magnetic Shell, by F. Bigelow, 219
Vertheilung der erdmagnetischen, etc., von Dr. Schmidt, 449
Terrestrial Refraction and Mirage, by Major MacMahon (New Publications), 218
Tetsner, Dr. F., Quer durch Preussische-Litauen (New Publications), 676
————, Zur Besiedelung und Germanisierung Deutsch - Litauens (New Publications), 327
Texas, New Publications—
The Soils of, by E. T. Dumble, 334
Thaika, Wadi, Oman, 532
Théel, H., Om sveriges zoologiska hafsstation Kristineberg (New Publications), 109
Theoretical Geography, letter from Prof. W. M. Davis on, 557
Thirlmere valley, 616
Thiselton-Dyer, Mr., remarks on "A Journey across Tibet," 479
Thomas, E., Le Bokaha, quelques notes sur le pays (New Publications), 564
Thomas, T. P., The City Government of Baltimore (New Publications), 444
Thompson, Prof., remarks on biological collections brought from the Antarctic, 518
Thomson, Joseph, by J. G. Bartholomew (New Publications), 119
————, von W. Wolkenhauer (New Publications), 339
Thoroddsen, Dr., Forschungen auf Reykjanes (New Publications), 328
————, Fra det nordøstlige Island (New Publications), 561
Thoroddsen, Dr., Geologische Karte des Südöstlichen Island (New Maps), 226
Thorshavn, Færoes, 8
Thoulet, Prof. J., De l'emploi de la photographie en océanographie (New Publications), 337
Thuringia, New Publications—
Ausrottung der Raubtiere im, von L. Gebing, 676
Tiaker-aguil lake, Kashgar range, 196
Tian Shan, MM. Grum Grjimailo's journeys in the Eastern, 656
Tibet, A Journey across, etc., by St. G. R. Littledale, 453 *et seq.*
——, Capt. Roborovsky's expedition to, 94
——, dissication of lakes in, 474
——, flora of, 479
Tibetan Lamaists, 201
——— plateau, 462
Tierra del Fuego, New Publications—
The Gold Diggings of Cape Horn, by J. R. Spears, 335
Tiflis, New Publications—
Temperatur des Erdbodens im Tiflisser Physikalischen Observatorium, 213
Tigris, rafts on the, 659
Tillo, A. de, Loi de la distribution du magnetisme (New Publications), 219
Tilton, J. L., South-western part of the Boston Basin (New Publications), 334
Timbuktu Region, French explorations in the, 98
Timbuktu, New Maps—
Carte topographique, par M. Vuillot, 451
Timbuktu, New Publications—
La région de Timbouctou, par R. Bluzet, 214
Timmerman, J., Standpunkt der physische Geographie (New Publications), 683
Tindholm, Færoes, 17
Tiva river, E. Africa, 409
Tiz, Makran, 395, 396
Toba lake, Batak Land, 77, 78
Todd, C., Meteorological Observations made in S. Australia (New Publications), 682
Toepfer, Dr., Die Wald- und Wasserverhältnisse des Fürstentums Schwarzburg-Sondershausen (New Publications), 108
Togoland, New Maps—
Expedition des Deutschen Togo Komitee's unter Drs. Gruner, Döring, und Lieut. v. Carnap, 451
Togoland, New Publications—
Deutschen Kolonie Togo, van L. Conradt, 443
Meine Reise im Togolande, von Hauptmann Kling, 563
Tongan dominions, Niuafóu island of the, 65
Tonkin au Yunnan, Du, par le Prince Henri d'Orléans (New Publications), 212
Tonkin to Yunnan, Prince Henry of Orleans journey from, 93
Tonkin, New Publications—
Les Travaux publics et les Chemins de fer au Tonkin, par G. Renaud, 111

Topographic Forms, Composite Origin of, by A. P. Brigham (New Publications), 220
Topographie Ancienne, Catalogue de Cartes Anciennes (New Publications), 570
Torch and Colonial Book Circular, by E. A. Petherick (New Publications), 223
Toutée, Capt., expedition on the Niger, 97
———, Par le Dahomey et le Niger moyen au Sahara français (New Publications), 442
Townsend, C. H. T., On the Bio-Geography of Mexico, etc. (New Publications), 333
Trading Centres, Ancient, of the Persian Gulf, by Capt. A. Stiffe, 644
Traill, H. D., Life of Sir J. Franklin (New Publications), 569
Traill, W. H., on the earliest monument to Capt. Cook, 435
Transbaikalien, von Generalmajor z. D. Krahmer (New Publications), 213
Transcaspia and Khurasan, by Capt. G. V. Tarnovski (New Publications), 213
Transcaucasia, Distribution of Armenians in, 312
———, ethnography of, 548
Trans-Siberian Railway, Progress of the, 311
Transvaal, New Maps—
Kaart van de Zuid Afrikaansche Republiek, by J. Smulders, 688
Map of the, and Surrounding Countries, by W. and A. K. Johnston, 342
Southern Goldfields of the, by F. Jeppe, 451
Troye's Map of the, 687
Transvaal, New Publications—
Le Transvaal, Etat politique, etc., par M. Diamanti, 113
Transylvania, New Publications—
Das Jara-Thal and seine Bewohner, by Prof. Czirbusz, 561
Travancore, New Publications—
Report on the Census of, by V. Nagam Aiya, 330
Travellers, Hints to, lectures by professors of Paris Museum, 319
Treaties, New Publications—
Collection of Commercial Treaties . . . between Great Britain and Foreign Powers, by Sir E. Hertslet, 571
Tripoli, Mr. H. S. Cowper's journey in, 551
———, Notes on a Journey in Tarhuna and Gharian, by H. S. Cowper, 150 *et seq.*
Tripoli, New Publications—
Tripoli et les voies commerciales du Soudan, par M. d'Attanoux, 333
Tripp, C., Tobacco Industry of India and Far East (New Publications), 562
Trotter, Colonel J. K., visit to the source of the Niger, 313
Trotter, Coutts, letter from, on the Island of Niuafóu, 210
Troup, J., Industrial and Commercial Development of Japan (New Publications), 678
Troutbeck, Vale of, 611
Troye's Map of the Transvaal (New Maps), 687
Tseku, station of the Tibetan mission, 301
Tsetse Fly-Disease, The, by W. F. Blandford (New Publications), 686
Tubaran, Makran, 404
Tugwell, Bishop, Visit to Bida (New Publications), 443
Tunis, New Publications—
La Colonisation française en Tunisie, par M. Saurin, 215
La Tunisie, Histoire de la Colonisation, par Ch. Riban, 215
Turfan oasis, 657
Turkey in Asia, Cuinet's, Review on, by G. G. Chisholm, 281
Turkey, New Publications—
Eisenbahnen in der Türkei, von W. Heintze, 440
Turum-Pusht, marble quarry at, 171
Twelve Hundred Miles in a Waggon, by Miss A. B. Balfour (New Publications), 332
Tyin, Jebel, 524
——, Wadi, 522, 526, 527
Tyneside Geographical Society, progress of, 103
Tyrol, New Publications—
Der Vomperkette des Karwendelgebirges, von E. Platz, 107
Schlösser und Burgen in Tirol, von J. C. Platter, 107
Tyrrell, Mr., Work east of Lake Winnipeg, 413

U.

Ukambani hills, E. Africa, 662
Ulu district, E. Africa, 407, 411
Ulug-art pass, Kashgar range, 195
Uluguru District, Dr. Stuhlmann on the, 314
United States, population of the, 194, 195
———, Ship Canals in the, Dr. Deckert's account of, 553
United States, New Maps—
Hydrographic Charts, 124, 228, 452
Indexed County, etc., Guides to the, Rand, McNally & Co.'s, 451
United States, New Publications—
Climate and Health of, by W. Phillips, 216
Colonial Origins of New England Senates, by F. L. Riley, 679
Free Burghs in the United States, by J. H. Blodgett, 564
Geological Atlas of the, by B. Willis, 444
Miscellaneous Statistics of Eleventh Census, 564
Natural Mineral Waters of the, by A. C. Peale, 114
Potable Waters of the Eastern United States, by W. M'Gee, 216
Public Lands and their Water Supply, by F. H. Newell, 680
Report of Chief of Weather Bureau, 333

United States, New Publications—*contd.*
Results of Stream Measurements, by F. H. Newell, 115
Survey . . . of Indian Territory, by H. Gannett, 565
United States of America, 1765-1865, by E. Channing, 679
Universel, Atlas, de Géographie, par F. Schrader (New Maps), 343
University Extension in Austria: Geography, 91
Uruguay, New Publications—
Bureau of American Republics, Bulletins of, 682
Usambara, Ethnology of, Lieut. Storch's observations on the, 429
Usukuma, New Publications—
Oberflächengestalt und Klima von, von C. W. Werther, 678
Uwemba country, Central Africa, 372
Uzielli, G., Piero di Andrea Strozzi viaggiatore fiorentino (New Publications), 119

V.

Vai Lahi, Niuafóu island, 70
Valderrama, M., La Cuestion de Limited entre Chile i la República Arjentina (New Publications), 217
Valentin, Dr., Excursion efectuada en la Provincia de San Luis (New Publications), 445
Vambéry, H., Bilder aus Chiwa (New Publications), 441
Vancouver Island, New Publications—
Notes on, by A. Begg, 215
Varthema, L., supposed discovery of the Moluccas, 366
Varzuuna, Persia, 169
Vasco da Gama Celebration in Portugal, proposed, 103
Vasco, G., Madagascar: les forêts, le caoutchouc (New Publications), 214
Vasseur et Fournier, MM., L'extension . . . du massif ancien des Maures (New Publications), 439
Vaughan, Capt., Journeys in Persia, 24 *et seq*, 163 *et seq*.
Vaux, M. de, Note sur un ouvrage . . . de Maçoudi (New Publications), 684
Vedel, P., On the Growth, etc., of Ice (New Publications), 224
Vegetation of the Peloponnesus, Dr. Philippson on, 426
Velthuyzen, Lieut., explorations in Dutch New Guinea, 432
Venezuela, New Publications—
Controversy between Venezuela and Great Britain, by Chas. P. Daly, 566
Die Grenzen Venezuelas, von Prof. Sievers, 335, 446
Documents . . . relating to Boundary between British Guiana and, 445
Im Delta des Orinoko, von Graf. zu Erbach-Erbach, 566
Short Sketch of History, etc., 682
Venezuela, New Publications—*continued.*
The Facts about the Venezuela Boundary, by J. Bolton, 334
Venezuela: her Government, etc., by W. E. Curtis, 445
Venezuela and British Guiana Boundary, by Dr. H. R. Mill, 217
Zweite Reise in Venezuela, von Dr. Sievers, 446
Venezuelan and British Guiana Boundary Frontier, Mr. Dixon's note on, 99; *see also* British Guiana
Venezuelan claims in Guiana, 278
Vents et de la pluie, La circulation des, par M. Duponchel (New Publications), 118
Venukoff, M., Sur la réduction des cartes topographiques, etc. (New Publications), 447
Verde, Cape, currents round, 269
Verhelst, Ed., Aische-en-Refail (New Publications), 327
Verhoeff, C., Blumen . . . der Insel Norderney (New Publications), 439
Verrier, Dr., Étude des arbres à quinquina (New Publications), 219
Vesperas do Centenario, etc., by R. Dozy (New Publications), 439
Vibert, Paul, Exploration aux Antilles (New Publications), 335
Victoria glacier, New Zealand Alps, 495
———, Lake, Pamirs, 93
Victoria, New Publications—
Statistical Register of, 446
Victorian Year-Book, 1894..336
Victoria Nyanza, The New Road from Mombasa to the, 662
Vienna University, geography at, 91
——— Military Geographical Institute in, 91
Vilkitzki, Col., explorations of Siberian rivers, 545
Vilsalpsee, depth, etc., of, 199
Virginia Indians, Government, etc., of, by S. R. Hendren (New Publications), 334
Virginia, New Publications—
White Servitude in, by J. C. Ballagh, 216
Vistula, New Publications—
Die untere Weichsel und ihre neue Mündung, von Dr. Zweck, 327
Vogan, A. J., Map of the Coolgardie Goldfields (New Maps), 688
Volcanoes, New Publications—
Les phénomènes éruptifs sous marins, par J. Girard, 568
Volcanic Phenomena, by J. L. Lobley, 568
Vomperkette des Karwendelgebirges, Studienfahrten im Gebiete der, von E. Platz (New Publications), 107
Voyageurs naturalistes, Conseils aux, par M. Filhol (New Publications), 340
Voyageuses françaises, Rôle des, par M. Barbier (New Publications), 224
Vuillier, M. G., La Sicile, impressions du présent et du passé (New Publications), 328

Vuillot, M., book on the Sahara, notice of, 276
———, Carte topographique de la Région de Tombouctou (New Maps), 451

W.

Wadi el Ghan, Tripoli, 160
Wadi Thaika, Oman, 532
Wadi Tyin, Arabia, 522 *et seq.*
Wagner, Prof. H., Areal und mittlere Erhebung der Landflächen (New Publications), 218
———, Geographisches Jahrbuch (New Publications), 340
Wahab, Col., survey work on the Pamir Boundary Commission, 92
Wakamba tribe, E. Africa, 551
Wakilindi and other tribes, Lieut. Storch on the customs of, 429
Waldau, G., Resa till Ngolo-landet (New Publications), 563
Walker, General J. T., Obituary of, 320
Walker, J. B., Life and Voyages of, A. J. Tasman (New Publications), 684
Waller, Rev. H., Obituary of, 558
———, The Case of our Zanzibar Slaves (New Publications), 443
Walter, E., Does the Delaware Water Gap consist of Two River Gorges? (New Publications), 216
Warburg, Dr. O., The Discovery of the Moluccas, 365
———, Wer ist der Entdecker der Gewürz-Inseln? (New Publications), 563
Warri, Major Copland-Crawford's journey from, to Sapele, 661
Wästfält, H., Nagra skildringar fran den Wellmanska polarexpedition (New Publications), 567
Waswanipi lake, Canada, 316
Watendlath, Lakeland, 616
Waterways of English Lakeland, by J. E. Marr, 602 *et seq.*
Wauters, A. J., Bibliographie du Congo, 1880–95 (New Publications), 213; notice of, 276
———, Carte . . . du Chemin de Fer du Congo (New Maps), 342
———, Encore la question de la priorité de la découverte de l'Afrique centrale (New Publications), 113
———, La Rivière Sanga (New Publications), 442
———, map of the Sanga basin, note on, 552
———, on the Mahdist Power on the Upper Nile, 552
Waves, New Publications—
Lois de l'extinction d'une houle, etc., par M. Boussinesq, 118
Way, Mr., surveys of the Patkoi range, 202
Weatherley, Mr., new route to Lake Mweru, 204
Wegener, Dr. G., Herbsttage in Andalusien (New Publications), 440
Weiss and Schram, Publicationen für die Internationale Erdmessung (New Publications), 682
Weissbuch [Afrika], Sechszehnter Theil (New Publications), 442
Weissensee, depth, etc., of, 199
Wellby, Capt., A Trip in Somali Land (New Publications), 113
Welle and Darfur, Capt. Nilis' explorations between the, 203
Wellsted, Lieut., journey in Arabia, 522
Weltverkehrs, Wandkarte des, von A. Herrich (New Maps), 574
Werther, C. W., Oberflächengestalt und Klima von Usukuma (New Publications), 678
West, Dr., The Riviera, by Ch. Lenthéric, translated by (New Publications), 212
West, R. H., Barometrical Determination of Heights in Lebanon (New Publications), 678
West Indies, New Publications—
A West India Island, by Sir H. W. Norman, 335
Momenter af Vestindiens Geografi, ved C. H. Lassen, 217
Politisch-geographische . . . Westindien, von Dr. Deckert, 335
West Indies and Spanish Main, by J. Rodway, 566
Weston, Rev. W., Exploration in the Japanese Alps, 1891–94 . . 125 *et seq.*
———, Explorations in the Japanese Alps (New Publications), 330
Westphal, Prof., Untersuchungen über den selbstregistrirenden Universalpegel zu Swinemünde (New Publications), 221
Weyer, Dr., Die magnetische Declination, etc. (New Publications), 449
Whales of the Antarctic, 516
Wheeler, Stephen, letter from, on the Anglo-Afghan Frontier Agreement, 674
White, A. Silva, Australia as a Strategic Base (New Publications), 446
Wichmann, H., Der Streit über die Grenze von Britisch-Guayana (New Publications), 445
Widenmann, Dr., Bericht über die Klima Moshi am Kilimandjaro (New Publications), 332
Wiegand, Dr., Deutsche Kolonisation in Südamerika (New Publications), 217
Wif, Wadi, Tripoli, 159, 160
Wilcox, W. D., Lake Louise in the Canadian Rocky Mountains, 49 *et seq.*
Williams, H. S., James Dwight Dana (New Publications), 222
Williams, J. C., The Future of our Sugar-producing Colonies (New Publications), 341
Willis, B., Development of the Geologic Atlas of the United States (New Publications), 444
Willkomm, Prof. Dr. M. (New Publications), 339

Wilson, H. M., Topography, etc., of Northern India (New Publications), 440
Wilson, H. W., The Protection of our Commerce in War (New Publications), 340
Wilson, Sir C. W., Remarks on "Proposed Geographical Description of the British Islands," 356
————————, Review of Professor Ramsey's work on Phrygia, 190
Winchell, H. V., and Grant, U. S., Report on the Rainy Lake gold region (New Publications), 334
Windermere, stream diversion at, 619
Winds, New Publications—
Variations de la vitesse des vents, etc., par J. Plumandon, 220
Winnipeg, Lake, Mr. Tyrrell's work east of, 413
Wise, W. L., Gleanings from Patent Laws of all Countries (New Publications), 685
Witwatersrand, New Maps—
Map of the, by S. Goldman, 121
Woeikof, A., Das Centralasiens (New Publications), 677
————————, Geologische Klimate (New Publications), 117
Wolkenhauer, W., Otto Ehlers (New Publications), 569
————————, Joseph Thomson (New Publications), 339
Women, Part of, in Colonization, C. Lemire on (New Publications), 118
Wom river, French Congo region, 553
Woodthorpe, Col., Remarks on "A Journey across Tibet," 480
————————, The Country of the Shans, 577 *et seq.*
————————, The Shan Hills (New Publications), 441
Woodward, Dr., Remarks on "The Waterways of English Lakeland," 622
Woodward, H. P., Mining Handbook to Western Australia (New Publications), 336
World, New Maps—
Spamer's Grosser Hand-atlas, 574
Travellers' Route Chart of the, by J. G. Bartholomew, 452
Wandkarte des Weltverkehrs, von A. Herrich, 574
Worsfold, W. B., South Africa (New Publications), 215
Wortzusammensetzung im Griechischen, etc., von Dr. Muller (New Publications), 685
Wouwermans, A., Contribution à la bibliographie de la locomotion aerienne (New Publications), 223
Württembergische Forschungsreisende and Geographen, von E. Metzger (New Publications), 569
Wyoming, New Publications—
Geological Reconnaissance in, by G. H. Eldridge, 216

Y.

Yakeyama peak, Japanese Alps, 147
Yakút al Rumí, account of Kais, 647
Yang Lam chief, burial rites of a, 598
Yangtse Kiang, New Publications—
2500 kilometer opover Yangtse Kiang af W. Coucheron-Aamot, 111
Zwei Jahre am, von Prof. Hirth, 329
Que signifie le nom de Yangtze? par L. Metchnikoff, 562
Yangu village, position of, 429
Yaos in British Central Africa, 378
Yarigatake, Japanese Alps, 128, 147
Yates, O. V., The Northern Balochis (New Publications), 110
Yellowstone National Park, by H. M. Chittenden (New Publications), 680
Yenisei, Explorations of the, 545
Yezd, Persia, 28, 29
Younghusband, Capt. F. E., Narrative of Travels in Manchuria . . . Pamirs and Chitral (New Publications), 562
Younghusband, Capts. G. J. and F. E., The Relief of Chitral (New Publications), 212
Yucatan, New Publications—
Flora of, by C. F. Millspaugh, 444
Yukatekische Forschungen, von T. Maler, 115
Yukatekische Forschungen, von T. Maler (New Publications), 115
Yun-nan to British India, by Prince Henry of Orleans, 300
Yunnan, New Publications—
Lettre sur le, par M. Roux, 329

Z.

Zanzibar Slaves, The Case of our, by Rev. H. Waller (New Publications), 443
Zatri, Jebel al, 532
Zenda-Rud river, Persia, 168
Zhdanko, Lieut., on hydrographic researches in the Arctic Ocean, 555
Zoroastrian cities, ruins of, in Persia, 34, 35, 39
Zululand, New Maps—
Map of, showing positions of Gold and Coal Fields, etc., by J. Garrard, 121
Zurich, Lake of, origin of, 655
Zweck, Dr., Die untere Weichsel und ihre neue Mündung (New Publications), 327

INDEX TO MAPS.

EUROPE.

English Lake District—
Map of, showing Relation of Radial Drainage to Geological Structure, 603
Færoe Islands, Sketch-map, 3
Map to illustrate a paper on the Waterways of English Lakeland, 688
North Sea and Atlantic Ocean, Surface temperature of, Plates 6–10..344
North Sea, Barometer Charts of the, 258–261
————, Surface salinity of, Plates 1–5..344

ASIA.

El Kais, Persian Gulf, Sketch-map, 647
Japanese Alps, Sketch-map of, 228
Makran, Sketch-map of, 452
Persia, Central, Map of Capt. Vaughan's routes in, 124
Siam and Indo-China, Sketch-map of, 298
Sketch-Map of the Shan States, 688
Tali-fu and Sadiya, Sketch-map of territory between, 302
Tarhuna and Gharian, Tripoli, 228
Tibet, Mr. Littledale's routes in, Maps of, 576
Wadi Tyin, Arabia, Sketch-map of, 576

AFRICA.

Chikala to Lujende, Sketch-map of route from, 185
Ethiopian Region of the Geography of Mammals, 344
Niger Region, Upper, Sketch-map of, 98
Ulu and Kitwyi, Sketch-map of, 452

AMERICA.

British Guiana, Sketch-map of, 100
Canada, Louise, Lake, Sketch-maps of Region of, 51, 53
Kuyuni, Upper, British Guiana, Sketch-map of, 576

ANTARCTIC.

Graham Land, Antarctic, Sketch-map of, 509

AUSTRALASIA.

New Zealand, Southern Alps of, Sketch-map of, 576
Niuafóu, South Pacific, Plan of, 66

ILLUSTRATIONS AND DIAGRAMS.

EUROPE.

English Lakeland—
Edenside, view of, 606
Haweswater from Measand, 614
High Cup Valley, Diagram section through, 607
High Cup Gill, Head of, 608
Nunnery Walks, 609
Stonethwaite, alluvial flat, 618
Sty Head Tarn, 617
Windermere, Diagram Section from, 612

Færoes—
Drangar and Tindholm, 15
Glacial striæ at Trangisvaag, 17
Klaksvig, Bay of, 7
Leinum, View from, 5
Myggenæs—Landing-place, 11
Saxen, Cliff south of, 13
Tindholm from south, 9

ASIA.

Japan—
Hashido, Bridge over Ontakegawa, 141
Hodakayama from the east, 127
Kasadake, Ravine south of, 131
Mountain pilgrim, 145
Ono No Taki waterfall, 135
Ontake crater, 133
Ontake, Shrine on summit of, 143
Tenryugawa, Silk filatures on the, 140
Yarigatake, Ridge south of, 129
Kais, Persian Gulf, ancient subterranean aqueduct, 645
Shan Country—
Ban Law Ferry, 583
Inle Lake, 585
Shan Country—
Kaw Village, 592
Keng Kong, 595
Mekong above Tang Aw, 579
Monastery, Pung Pyin, 597
Wan Tham, 581
Western Shans, 589
Tibet—
Boat laden with baggage on the Sachu Chu, 457
Goring La, View near the, 459
Lamas' encampment, 465
Tibetan valley, Typical, 461
——— group, 463

AFRICA.

British Central Africa—
Cheza peak in the Mlanji hills, 379
Chiromo, on the Ruo, 371
Fort Lister, Stream at, 383
Mlanje post-office, 384
Nyasa, Lake, south end of, 375
Ruo, Falls of the, 381
Shire rapids, Upper, 373
Yao village, Blantyre, 377
Zambezi near Chapinga, 369
Zomba, Native woman of, 382
Tripoli—
Isolated hills near Wadi Haira, 161
Jebel Jumma, 159
Kasr Zugueeh, 155
Roman wall in Wadi Daun, 157
Senam at Kom es Las, 153
——— bu Matirah, 157
——— el Megagerah, 159
Shaahbet el Zeraghwanieh, 161
Wadi Doga, 151

AMERICA.

Canada—
Lake Louise, end of west shore, 55
Lefroy, Mount, Looking towards, 57
Canada—
Paradise valley, Entrance to, 59
Temple, Mount, 61, 63

AUSTRALASIA.

New Zealand—
Copland river, Looking down the, 489
Franz Josef glacier, 495
Graham's Saddle, 497
Marchant valley, Looking down towards the, 487
Tasman, Mount, 493
Tasman valley, 485
Victoria glacier, Cliff precipices coming down to the, 491
Niuafóu, South Pacific, View of craters, 67, 68

GENERAL.

Challenger Medal, 207
Diagrams for predicting the Circumstances of an Occultation of a Star by the Moon, 688
Earth's Crust, Diagrams illustrating movements of the, 251–255

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